

AVIATION

The Oldest American Aeronautical Magazine

MARCH 26, 1928

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Formation of Italian planes in honor of the King of Afghanistan's recent visit to Rome.

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Special Features

NUMBER
13

The Comet Engine
Simplex Red Arrow Planes
The 1928 National Air Races

AVIATION PUBLISHING CORPORATION

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20% of the time of this drafting room is devoted to orders in production—90% the time's share, to research and development for tomorrow's planes.



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as used by the Canadian Transcontinental Airways

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Captain Harry Rogers writes: "One of the outstanding features of this trip was the construction of the motor. Not only did the air give us more power for the travel but it was very economical from a consumption point of view. We can really make the difference now in using other gas."

"Both Max Hubert and myself were in complete agreement on your product. Thinking you for just continue, I beg to remark. Very truly yours,

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WRIGHT AERONAUTICAL CORPORATION
Paterson, New Jersey U.S.A.

WRIGHT

*That's why
They don't fly them!*



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Insurance Precautions

ONE ALL important step that has recently been made in the progress of commercial aviation in this country is the securing of the assistance of various insurance companies to the extent that they are now willing to accept certain risks. This advancement in itself has a major bearing upon the future possibilities of all phases of commercial aviation, for without the entry of insurance companies into the industry it would be practically impossible to secure the assistance of financing companies. Without financing companies relatively few aircraft manufacturers would be able to install time payment plans and continue manufacturing. And without time payment plans the cost of a plane would continue to remain at a figure greater than the average pocketbook could stand, which in turn would curb sales and likewise production.

All that being true it seems highly advisable that those in charge of airlines, flying schools, airports, etc., as well as individual plane owners, should take particular care that they live up to the requirements stipulated by insurance companies. Also, they should exert more than a little effort in maintaining, so much as possible, the various rules, both of which can be accomplished through the medium of what might be termed a perpetual education campaign.

Persons stating that smoking is absolutely prohibited should be put in conspicuous places both inside and outside of hangars. This rule in particular should be enforced to the very limit. Precautionary measures should be taken against nightmen getting too close to planes running up, or trespassing where condemnation or, at times, even result in injury to body and damage to property. All pilots visiting an airport should be acquainted with the local field rules upon their arrival, and incidentally, made to comply with them. Students and pilots alike should be continually warned against taking chances such as cross country flying with "just enough gas", etc. In short, insurance flying first measures of all descriptions should be adopted, for it is only by doing this that aviation, and subsequent advancement will prove most successful.

Henceforth, most American newspaper companies have considered aviation too great a risk to be of business interest to them. Now that they have extended their aid if the industry does not fulfill its part of the bargain there is the possibility that insurance companies may consider that aviation has proved itself to be too great a risk and cause them to withdraw, an action which would unquestionably have a most disastrous effect upon commercial aeronautical development in the United States.

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The Challenge

THE TRANS ATLANTIC flying season has opened with another fatality. A renowned English pilot and a sporting English lady have lost their lives in trying to do what every one knows is possible but impracticable. The importance of the tragedy lies rather in its effect upon public opinion, than in its relation to whether or not flying across the Atlantic will ever be practical. The general public realizes that flying the Atlantic in a single crossed plane is a stunt and a foolhardy one at that, but often it has been brought up to consider all flying as more or less of a stunt the tragedy only help to confirm the belief.

Those who know something about aviation can distinguish between a dangerous stunt and flying under reasonable conditions, and they do not regard the failure of Atlantic flights as having anything to do with their own flying. Nevertheless they are gradually getting the impression that flying across the Atlantic is impossible with any equipment now obtainable. Certainly it is true that there is no existing airplane or flying boat which is suitable for trans-oceanic service, but this does not prove that such equipment could not be built.

The crossing of the Atlantic has stood as a challenge to the aviators of the world and the challenge has been successfully met. The construction of a plane capable of crossing the Atlantic is a challenge to our technicians. That they will ultimately conquer there is no doubt, but it will not be an easy battle.

Foreign Markets

AMERICAN COMMERCIAL manufacturers of planes and accessories who have the foresight to spend some time and effort in cultivating foreign sales will in the long run establish a profitable business which will give them a steady outlet for their products. The export business cannot however be built up without considerable cultivation and study. Not only must personnel be made but operating conditions and export requirements must be gone into.

For example, recent reports from Canada indicate that American firms are exporting without making out the proper taxation and in the case of replacement parts they are putting on a high price which greatly increases the custom charges. Such practices naturally annoy those receiving the goods, and do not encourage the continuance of exports. The International requirements for design features are somewhat different from our own and it will be necessary for exporters in the factories to study these and adopt these designs.

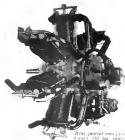
The Comet Engine

A Seven Cylinder Radial Rated at 150 Hp. at 1800 R.P.M.

EARLY IN December of last year the Aircraft Division of Oakland, Calif., placed in a Waco 10 the first of "The Comet" seven cylinder, 150 hp. aviation engines answered a short time previously. At the various airports of Northern California where the Comet powered Waco 10 has rolled, very intense interest is and is here being aroused by its close lines and impressive appearance. It is stated to take off in six seconds, cruise at 180 mph at 5500 rpm and make 120 mph at full throttle. With a full tank of gasoline and the pilot, it makes 15,000 ft. easily, climbing the first 10,000 in 11 min. Fuel economy resulted from the excellent perfect combustion of oil mixture, so that the Comet will always take the gas according to the report.

The Comet as it stands today is said to be the result of two years intensive research and experimentation in a place where equipment and facilities have been developed especially for the construction of aircraft engines. It has seven air cooled cylinders of 4½ in. bore and 5½ in. stroke and is rated at 150 hp. at 1800 rpm. The features are its solid master connecting rod and two piece crankshaft, its master valve mechanism and the absolutely clean lines in front making for maximum head resistance.

The main crankcase is divided into two sections in the place of the cylinders and joined by cross strength bolts between



After cylinder ring 12 in. 4 inch 250 hp. engine

the crankshaft of the propeller from the shaft to the engine mounting by way of the crankcase. The crank of this design is light construction in which the crankshaft lead is divided equally between the two main bearings so that working between the two main bearings is divided. The same result was made accomplished by secure maximum rigidity and strength.

The single three two piece crankshaft is supported on the one end and the two roller bearings. There is one on each side of the crank pin and the third just behind the propeller hub, all of which take the propeller thrust as well as the radial load.

To assemble the single piece master rod the shaft is divided into forward and rear sections. The crank pin is aligned with the forward section which transmits the power to the propeller hub carried by it. The rear section telescopes into the crank pin and is secured completely through it. The pin sections are sealed by a nut on the rear section and kept in proper position relation by keys.

Connecting Rod is Solid Big End Type

This master connecting rod is a solid big end type. Its construction makes possible high crank speeds which has, as a result, an increase in the power output. The rod is assembled with a two piece rod. The rod is fitted into the crank pin and the two sections are secured by a nut on the rear section and kept in proper position relation by keys.

The cylinder barrels have tapered fins and are mounted on two steel forgings. The barrel is secured and shrunk onto a cast aluminum alloy cylinder head. The cylinder has an inlet and one exhaust valve working on a common lower intake valve which are driven into the head casting.

One of the marked advantages which the Comet has come in both blank tests and under flying conditions is its low horsepower. This is due in part to the large and simple cooling fins on the cylinder and also to the valve arrangement which will be explained later.

Each valve is operated by a single master arm, and the

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each valve is located directly behind the cylinder actuated by the master arm through solid push rods which pass directly through an opening in the intake manifold. Intake air mixed valves are threaded to secure the valve spring, causing water which is threaded and screws directly on to cause them. The valve clearance adjusting nuts have polished surfaces to permit adjustment. These nuts are located and secure on the end of the valve stem until the correct clearance is obtained, then the valve stem is ground up and serves as a lock for the adjusting nut. Each one has two concentric springs.

Valves are Well Placed

The main which actuates all the valves runs on a double row of bearings, a series of upper gears drive the cam at one end with crankshaft speed in the direction of crankshaft rotation. Another reason for the remarkably good cooling to the valves in the Comet is pointed out in the placing of a valve. The exhaust is in front where it gets the maximum cooling effect of the propeller draft, and the intake is back where its temperature is kept up and the maximum heat is lost. As a result of this arrangement, there is but a small difference in temperature between the intake and exhaust valves.

The magneto and tachometer are driven from the cam on whose shafts are mounted on the ball bearings. The 6 pumps are driven direct off the master shaft. The fuel pump is located directly to the crankshaft extension.

Only Two Oil Lines

The oil pump assembly consists of two gear pumps, one driven by the propeller to the engine bearings and the other for scavenging. Oil is taken from the tank by the pressure pump and after passing through a strainer located in the hot end of the oil tank is delivered to the oil collector ring where it is forced in through the center of the crankshaft to the oil pin bearing. Oil is discharged from the crankshaft with scavenging pump, and located at crank pin and the other end of the crankshaft, where it returns to an oil collector tank between Nos. 4 and No. 5 cylinders from which it is returned to the oil tank by the scavenger pump. The shape of the worm oil is carried to a jacket around the outside of the barrel in the tank. There are only two lines, one inlet or suction line, and one outlet or scavenge line. The fuel mixture is taken from the carburetor and delivered to the cylinder by means of a diffuser fan which forces it through the crankshaft speed.

Ignition is furnished by two seven cylinder Scintilla magnetos located at the rear of the engine, which fire spark plugs in all seven cylinders thus giving two independent sources of spark. A Scintilla hand control magnetos is furnished for starting ignites.

The engine is completely equipped and ready to run. The equipment includes Stronberg or Knappe carburetor, supercharger air filter, two Scintilla magnetos, propeller hub for



Diagram of the Comet engine showing the arrangement of the seven cylinders and the crankshaft.

start, propeller, mounting ring, five gallons of tank, complete with flexible oil lines and all fittings, Lockhart-Burner primer with timing and all connections, seven short exhaust stacks, complete set of tools and an instruction book.

The Comet is now reported on a limited production schedule which will put the first engines on the market in April with a steadily increasing program for the future months as the line is loaded up. Widespread interest among airplane manufacturers and prospective motor dealers is said to have been stimulated by the preliminary announcements on the Comet and officials of the company anticipate a demand which will exceed production for some time.



The two piece master connecting rod and crankshaft of the Comet 150 hp. engine

the cylinders as well as by the cylinder design. The mounting ring which supports the engine in the airplane is attached to an end of the through bolts. The gear cover covers the magneto and tachometer gears and the oil distributor bearing as well as the oil pump. The blower or rear section supports the magneto.

The nose or front section of the case is hemispherical in shape and carries a deep groove ball bearing which transmits



Front quarter view of a Waco 10 fitted with a Comet 150 hp. engine

Simplex Red Arrow Planes

Ohio Company Producing Open Cockpit and Closed Cabin Monoplanes,
Each Powered With a 100 Hp. Kinner Engine

THE SIMPLEX Aircraft Corp. of Dayton, O., is now producing on a scheduled basis a series of monoplanes known as "Red Arrow Planes", which are extremely broad and powered with five-cylinder 100 hp. Kinner engines. A number of experimental models have been completed and production has been started on two designs, a two-place open cockpit model and a two-place closed cabin model. The two planes are sketched except for the covering of the cockpit.

Red Arrow planes have a distinctive and original mounting of the wing which is located at the center or down line of the fuselage with external wing supports braced to a transverse frame. The leading gear is mounted on the same transverse frame. The closed plane is stated to weigh 750 lb. empty, and to carry a useful load of the same amount. With this load, according to figures supplied by the manufacturer, the closed model has a high speed of 130 m.p.h. and a landing speed of 40 m.p.h. with an average climb of 600 ft./min. to 20,000 ft. and a service ceiling of 16,000 ft. Tanks are provided for efficient fuel for a sustained flight of 22 to 24 hr.

Both Models are Structurally Rigid

Both models are structurally the same except for the covering of the cockpit on the cabin type. The framing of the cabin tends to give the fuselage a somewhat awkward appearance though it is as streamlined as possible. The open model appears more conventional while in perhaps due to the lack of a "hump" on the top of the fuselage caused by the rigid change in depth of the fuselage at the cabin. This depth of fuselage has evidently been carefully worked out to give the best streamline form without making the cost excessive.

The sides of the open cockpit model are very high giving an enclosed appearance to the plane resembling only a small windmill.

The construction follows usual practice having a welded steel tubular fuselage and wood wings covered with fabric. All control surfaces are of conventional design being solid.



Front view of the closed cabin model

and constructed of welded steel tubing. The landing gear is quite shallow with a high upper structure built above it. The wings are mounted to struts on the upper longerons. The wing supports are of steel tubing. This framing is somewhat complicated but according to the figures supplied by the manufacturer the structural weight is very low and the performance is not affected appreciably. The load factors are within the requirements of the Department of Commerce.

The fuselage trans a variety of steel tubing with no bracing. The wing spars are mounted to the upper longerons with fuselage cross members or center section spars shown.

Continued on page 161



Side view of the two-place open cockpit model of Simplex Red Arrow planes.

The 1928 National Air Races

Financial Plans Being Made to Assure Conducting Without Deficit.
Civilian, Army, Navy and International Events

ACCORDING TO reports from Los Angeles, Calif., which has been awarded the 1928 National Air Races to be held next September, a complete financial program for the raising of \$500,000 to assure conducting of the various events without a deficit is now well under way. The races are to be handled by a group of seven men, known as the California Air Race Association, and selected by the general representatives of the aviation industry in and near Los Angeles. The seven are: Theodore T. Bell, president of the American Aircraft Corporation, a leading attorney and an official of a Los Angeles bank; Dudley M. Steele, in charge of the aviation department, Hatfield Oil Co.; D. B. McDonald, motorcycle dealer of Pasadena, president Los Angeles Chapter National Aeronautic Association; Dr. C. Young, Glendale, director of California Development Assn., and a pioneer in aviation development in the West; Harry Weibel, V.P., Douglas Co., Santa Monica; John Downer, president, Western College of Aeronautics; and Robert J. Pfeiffer, editor "Western Flying".

Public Subscription Drive in Progress

This group at once on organized obtained pledges for some \$200,000, and then to obtain \$300,000 in cash and seek Mr. Steele to Washington, where the sanction of the N.A.A. for the holding of the race must be granted. To raise the remainder of the money a committee has been selected with a campaign organized to conduct a public subscription drive over a period of 11 weeks, which began about the middle of this month. Not all of this time, however, is to be devoted to the actual solicitation of subscriptions, part being allowed to the extensive preparation of the public stand. A set aside \$500,000 is expected to be realized through the campaign and through the pledges already obtained. With this in hand, it is anticipated by the management of the meet that there possibly will be a surplus when all expenses for the meet have been met, especially in view of the record made at Spokane last year when a small surplus was realized.

Preliminary arrangements for at least two international races have already been made and it is anticipated that an Italian and a British racing team will be at the events. Besides this the race association plans to give manufacturers of aircraft in this country, Canada, Mexico and smaller countries in the south, as well as oil companies, accessory manufacturers and others interested in the aviation industry, to enter exhibits in a four day associated exposition which will precede the actual race program. During these four days there are to be a number of aviation events of interest to the public and not directly connected with the national race program. Officials and aviation experts at these various countries are to be invited to be the guests of the City of Los Angeles during the meet.

While letters sent to the National Aeronautic Association indicate that the field to be used has been determined upon it is possible that this may be changed and that the long pre-

pared Los Angeles Municipal Airport may be made ready before September to accommodate the event. This was the statement of Percuss M. Bell, member of the finance committee of the city council, which has charge of the matter of selecting a airport for the city. In the event that this is not done, a field about 12 mi. from the center of Los Angeles and connected with the city by highways, trams, street cars and



An action picture of the late Kenneth Bradley in a Curtiss "Pusher" during Navy Day at Emeryville, Calif., 14 years ago.

interurban transit will be used. This field is about one mile square and lies at the middle of a large open area. The exact location has not been revealed, pending completion of necessary legal steps. The grandstand and temporary hangars will be erected on this field if it is used and there also will be installed a long series of loud speakers to convey announcements to the crowds. The proposed events for the National Air Race proper include:

1. A relay race open to all planes powered with original type OX-5 engines for a total of \$1500 is the prize money. There are to be five planes in a team and the requirement is that a minimum of four finish the race.
2. A free-to-all of 45 mi. for any plane with an engine of 518 cu. in. displacement or less. Total prize for this race is \$2500.
3. A free-to-all for all planes powered with engines of 720 cu. in. displacement or less. This is a 20 mi. race with \$1500 in prize money.
4. A free-to-all for planes powered with engines of 900

Continued on page 160

The Department of Commerce Requirements

Stress Analysis of Commercial Aircraft, Chapter Number Three

By PROFESSOR ALEXANDER KLEMIN

Expert Department, Federal Air Service

And GEORGE F. TITERTON

U. S. Air Corps, U. S. Army, U. S. Navy, U. S. Coast and Geodetic Survey

A PROPOSED Handbook for Airplane Designers (Commercial) has just been prepared and issued by the Department of Commerce. A copy may be secured from the Department by request and additional copies may be secured from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at five cents per copy. It is absolutely essential to have a copy of this pamphlet ready before the analysis of a commercial plane is begun. The pamphlet is based on the "Handbook for Airplane Designers" prepared by the Air Service, at McCook Field and issued to government aeronautics. Several changes have been made to adapt the proposed book more nearly to commercial requirements.

The Handbook lists the following in essential items in the designing the commercialness of an airplane:

- The structural strength of wings, ailerons, tail surfaces, fuselage, landing gear, including engine mount, bracing and control system.
- Cockpit, cabs, and control arrangements.
- Power plant and power-plant installation.
- Equipment and instruments.
- Propellers.
- Design of fittings.
- Materials and workmanship.
- Flying characteristics and qualities.

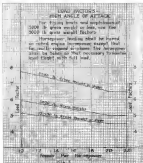
In the series of articles it is planned to cover only the requirements under a and the choice of structural members and design.

The Handbook requires that two copies of all drawings and calculations be submitted to the Department. One copy is for its file and the other is stamped in approval and returned to the manufacturer. The procedure followed in the case of licensing single airplanes of any type is the same. Regarding submission of drawings and analysis, the Handbook states the following requirements:

"It is shown that the following procedure places upon the manufacturer the burden of proving that his design is structurally safe, and he should keep this in mind when submitting data to the Department. In the majority of cases the Department's engineers will be able to use an airplane of the type they are examining at the time their check is being made, and the manufacturer must therefore make his drawings and analysis as clear as possible if he wishes to avoid delay and controversy in obtaining an approval. More statements of opinions should never be included in an analysis without presenting the facts upon which the opinion is based. Statements made from the specified methods of analysis because the structure being investigated does not conform to the requirements

load, or because the manufacturer has data indicating the load is not in safe, must be accompanied by a clear and concise statement of the reasons for the deviation and supported by data which may be available.

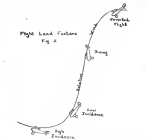
"In order that the structure may be shown as sufficient to be used for the conditions of the airplane, the load must be shown under an approved type of loading. The design must be shown complete and well-detailed. Accuracy of the design structural loads such as wings, stabilizer, etc., in value, etc., will suffice if they are completely dimensioned and



If they show the cross sections of all wooden members, all metal members of special design, and the area of standard wires, tubes, etc., and in the assembly. The location of hinges, control surfaces, and the points of attachment of all bracing wires and wires should be clearly shown. Drawings should be made to scale and important dimensions given. Dimensions referring to lengths of members, distances between supports, etc., are more satisfactory if shown in each view rather than first and end views.

"In order to represent the structure satisfactorily, the drawings submitted should include

- (1) A general assembly of each wing with the area and location of spars, drag struts, drag lines, leading edge, trailing edge, and members supporting the ailerons and control surfaces clearly indicated.
- (2) Drawings of a typical rib showing method of attachment to the spars and leading edge.
- (3) Line diagrams of the external wing bracing showing true dimensions, size of struts, and wires.
- (4) A layout of the fuselage structure showing size of all members of the primary structure.
- (5) Drawings of the tail surfaces showing size of spars, longer tubes, lateral and external bracing, location of hinges and ailerons.
- (6) General drawings giving a layout of the landing gear and showing size of struts, axle, bracing wires, shock absorber



spindles, spander tubes and other important members, and detail drawings or sketches showing the arrangement of members at their lower ends and the method of securing them, drawings of the tail and showing the load, the connection to the main fuselage structure, and the method of securing it, if any.

"For airplanes, drawings of the floats showing their location, general dimensions, and a layout showing size of struts and wires and method of attachment to the fuselage.

"Detail drawings of the mechanisms used to adjust the stabilizer, flaps, wing flaps, or similar surfaces while in flight are also desired.

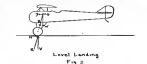
"Drawings showing the main wing fittings and the control system are required.

"The analysis must cover the investigation of the strength of the main members of the wings, tail surfaces, landing gear, including tail strut, fuselage, fittings, and control systems for the required load factors. The analysis of secondary members supporting heavy loads and the investigation of main members subject to secondary loads are required.

"Stress analysis of the control surfaces and control system may be simplified by tests made on these parts, as indicated as in flight. If the tests show that the risk will carry 150 per cent of the design load and if the risk, under test, or, without the loads specified. It is recommended that both analysis and tests be made on these parts and on the main wing fittings, though both are not required.

"It is particularly important that the stress analysis state the material used for various members, whether or not it is best treated, and that physical properties are guaranteed, not assumed, by the manufacturer. If metal members of special design are used, test data showing their strength properties under loads similar to those in which they will be subjected in the structure must be submitted.

"An analysis should be carefully checked as to estimate before being submitted for approval, as the Department will



stress analysis for correction when aerodynamic errors are found, except when their effect is obviously negligible."

When an airplane is in a condition of steady horizontal flight the weight of the machine is balanced by the lift. The loads on the structure of an airplane under the condition of flight are known as the basic loads. Besides aerodynamic and centrifugal loads in flight are also obtained in maneuvers such as pulling out of dives, barrel rolling, etc., impose far greater loads on the structure than the basic loads. For example, pulling out of a dive imposes particularly severe loads on the structure. At the point of recovery of horizontal flight the altitude of the plane may be close to the high maneuver condition but the speed is much greater than in normal horizontal flight at the same altitude. The loads imposed on the plane under this condition are a serious analysis of the basic loads for each type of plane depending upon the speed obtained on the dive and on the maneuverability. A factor of safety, often assumed to have a value of 2 or over depending



on the multiple of the basic loads to care for defective material or workmanship that has passed inspection. The "load factor" of the plane is the assumed factor of safety 2 times the multiple of the basic loads. The load factor times the basic load is then the "design load" or twice the maximum possible load that the plane is required to withstand.

The structural strength requirements for commercial airplanes may be obtained from Fig. 1. The requirements for motors or airplanes that are to be used for aerobics may be obtained from the Department to cover any specific design. The primary members of any airplane structure shall be, as when new, of sufficient strength to withstand the stresses in them for the conditions and load factors given below.

Fig. 2 is used to determine the load factor for the high maneuver as it is called high angle of attack flight condition. When this factor is obtained the low maneuver factor is found

Continued on page 776

The Keystone "Pirate"

Bombardment Plane Carries Crew of Five, Bomb Load of 2,150 Lb. and Is Powered With Two Geared 420 Hp. Liberty Engines

A CONTRACT was recently awarded by the Army Air Corps to the Keystone Aircraft Corp. of Bristol, Pa., for the construction of 25 bombardment planes to be known as the LB-5A or the Keystone "Pirate". They are very similar to the Barden "Gyrfalcon" which, it will be remembered, won the Air Transport Race to the National Air Races at Mitchell Field, N. Y., in 1933. The main difference is in the power plants and armament. The Pirate is powered with two 420 hp. geared Liberty engines. It is a biplane of conventional design with the engine mounted on the lower wing, one on each side of the fuselage. The fuselage is of welded steel tubing with the outer panels in the lower wing and the upper wing are of wood construction covered with fabric. The Pirate weighs 7,215 lb. empty. It carries a bomb load of 2,150 lb., with a crew of five and sufficient fuel to cruise 600 mi., and weighs 22,200 lb. loaded. C. Talbot Porter, chief engineer of Keystone, is the designer.

The load distribution on the Pirate is similar to that on most large twin-engine bombers. In the fuselage between the wings and very close to the center of gravity is a large bomb bay. In front of this is the cockpit for the two pilots, with seats side by side, while on the nose is the station for the forward gunner where the position of the bombardier, either of the pilots acts as bombardier. Behind the bomb bay is the fuselage, a compartment for the storage of six 500-lb. or 1,000-lb. bombs. Behind this is the tail section, where the top of the fuselage provides a passageway from front to rear cockpit, permitting personal contact between all crew members of the crew. Rafter (downer) seats the opening over the rear cockpit when it is in use.

The armament is such that the Pirate has practically as much armament as the Barden "Gyrfalcon" as a fighter aircraft. Two Lewis machine guns on a flexible mount are in the nose of the fuselage at the top, while above the rear cockpit are two guns, in addition to a single machine

gun that can be fired through an opening in the floor. The two forward Lewis guns can be swung through an angle of more than 100 deg. horizontally, as well as through any desired vertical angle. Two of the rear machine guns are mounted on the fuselage half-way between the wings and the tail



Front view of the Keystone "Pirate" bomber.

Then over the area above and to the rear, while the fifth machine gun affords protection against attacks from below.

A standard Army bomb rack is installed. Any combination of bombs can be carried to make up the full load, from a number of about 500-500 lb. bombs to one weighing a ton. The bombs are dropped by a release mechanism operated from the bombardier's position in the nose of the plane. The front gunner's cockpit, in the nose of the fuselage, is reached through the pilot's cockpit. Behind the front gunner's cockpit is a set of instruments for the use of the bombardier, and a bomb-sight is mounted just above the floor for sighting the target through the glass bottom of the nose.

The pilot's cockpit is just ahead of the leading edge of the

(Continued on page 782)



Front quarter view of the Keystone "Pirate", an Army Air Corps bomber built on the LB-5A.

Wright Company to Produce 140, 200 and 300 hp. Radial Engines

THE WRIGHT Aeronautical Corp. of Paterson, N. J., plans to produce a new series of radial air-cooled engines for commercial use, according to a recent announcement by Guy Vought, vice president and general manager of the company. These power plants are intended as yet, are to be built in three sizes developing 140 hp., 200 hp. and 300 hp. Each of all the engines will be interchangeable as much as possible and all the engines will be fitted with the same size mount,



Left to right: Guy Vought, vice president of the Wright company, Charles Lawrence, president, and Clyde E. K. Hinton, head of the Engine Division, standing before a Whitworth engine.

which immediately is identical to that of the present Wright Whitworth engine. This will enable aircraft manufacturers to employ one standard size of engine mount for all types of planes.

The new series is a development from the Wright Whitworth which, though it would have been given in production of this "22" series of "Whitworth" engines during the last eight years. The past year has been devoted to research and tests on the new power units and it is expected to take until the spring of 1936 before the Wright Aeronautical Corp. will be able to make deliveries to commercial manufacturers. The Wright "Gyrfalcon" developing 225 hp. has been undergoing extensive tests during the past two years and at least a similar time before the first Whitworth can be available for commercial use.

It is planned that the 140 hp. engine will replace the war surplus Curtiss OX-5 while the 300 hp. model is planned to replace the present J-5 Whitworth.

However, many commercial manufacturers have been called upon to furnish airplanes for special work which would naturally require some power plant than that delivered by J-5 Whitworth and for this reason the 300 hp. model is being developed. As the 300 hp. engine will have the same size engine mount as the present Wright Whitworth it will be possible to substitute the new power plant with a minimum of changes when greater performance is desired. It will therefore be possible for the airplane manufacturer to have one basic design in which can be installed different power engines to meet certain performance requirements.

A new building adjacent to the present Wright factory is nearing completion for use as a new assembly plant and for engine testing. Foundry space has been increased and there have been many changes in the machine and assembly shops to meet the increased demands for the Wright Whitworth and Gyrfalcon engines, as well as preparing for the production of the new line of three air-cooled engines. Technical data on these engines is not available for publication at this time.

Lockheed Aircraft Co. Completes Its New "Air Express" Monoplane

A NEW Lockheed monoplane for mail and passenger service named the "Air Express", was recently completed by the Lockheed Aircraft Co. of Los Angeles for the Western Air Express, Inc., operators of the Los Angeles-Santa Anita City air mail route. The new plane with lighted and fuselage and side wing and tail surfaces, was displayed for the first time at the recent 1935 Los Angeles Air Show.

The cabin of the plane has cargo space of from 50 to 100 cu. ft. for mail and baggage in addition to seating from two to four passengers. It is arranged for quick conversion into either additional passenger or cargo space.

The full consideration of the plane is mounted slightly above the fuselage on short struts which struts thus giving the pilot an elevated vision from his open pilot's cockpit behind and above the cabin. Powered with a Pratt & Whitney Wasp, this latest Lockheed creation is said to have a high speed of 117 m.p.h. and a cruising speed of 110 m.p.h. with the full 1800 lb. payload, 100 gal. of gasoline, and 10 gal. of lubricating oil. With this load the plane has a cruising range of from 700 to 800 mi. The average passenger consumption at cruising speed is about seven to eight miles per gallon of fuel. Both wing and fuselage of Air Express are of all plywood monocoque construction.

New Curtis Flying Service, Inc., Is Agent for Challenger Airplane

NEWLY FORMED at Providence, R. I., is the Curtis Flying Service, Inc. The company, which is state agent for the Challenger plane, has based a field at Pawtucket, R. I., at which air headquarters will be established as soon as preliminary work is finished.

Lord, Leonard R. Curtis of Providence, formerly with the R.A.F., is president as well as chief pilot and instructor of the company. The Brown University Aero Club of 25 members has been signed up as a nucleus for the flying school, and instruction on the ground and flying work has already been started.

The Pawtucket Field, lying between Pawtucket and Pawtucket, is being considered as an inter-city airport. The north and south runway is to be 1200 ft. in length, while the east and west run will be nearly double that distance when the necessary filling in has been accomplished. The field has a fine runway and is free from any dangerous obstructions. Other fields in the vicinity offer suitable terrain in case of forced landings.

Charles E. Kelly of Pawtucket is the vice president of the new corporation, Elmer M. Rogers of Pawtucket, R. I., is treasurer, Walter Johnson of Pawtucket, is secretary, and F. W. Fowler is advertising and publicity manager.

Special Aircraft Batteries Built By Willard Storage Battery Co.

THE WILLARD Storage Battery Co. of Cleveland, O., manufactures storage batteries specially designed for aircraft use. These batteries, which are used chiefly by the Navy Department, are now being manufactured for commercial aviation to be used where special storage batteries are required. In design they follow the lines of starting and lighting battery construction with the exception that they are made of cast-iron plates, 600 in. thick. Every effort is made to hold down the weight by the use of lighter materials combined with the strength.

Many Companies Display Products In Aero Exhibition at Los Angeles

THE FEATURE of the 10th annual Los Angeles Aero Show held there recently was the Aviation Exhibit, which occupied one whole tent, it being estimated that more than 100,000 visitors passed through the aeronautical section of the show.

Airplanes were exhibited by the California National Guard, Western Air Express, Lockheed Aircraft Co., Maitland Aircraft Corp., American Aircraft Corp., General Aircraft Co. and The Ryan Mechanic Monoplane Co. Arrangements and



The Lockheed Aircraft Co., exhibit at the Los Angeles Aero Show.

parts were shown by The Aero Corp. of California, the Warner School of Aeronautics, Pacific Aeronautics Corp., Short's School of Aviation, the S. A. A., Western Flying, and Aero Digest.

The displays themselves were particularly well laid out, one of the most interesting sights in the tent being the "Loon Koolie" monoplane of the Ryan Mechanic Monoplane Co. which was shown standing under the wing of the great tri-winged Falcon on display by the Western Air Express. W. A. E. also had the original Douglas mail plane of the Los Angeles-Lake City Air Route on display, as well as the new "Air Express" Lockheed Warp speed plane to be placed in charter service. The National Guard squadron displayed a Douglas observation and bombardment plane, including the methods of manning and using such equipment. The Lockheed Warp monoplane attracted wide attention because of its trim and attractive appearance.

A Ryan Broughman biplane recently crashed was displayed by the Western Air Express. Maitland Aircraft Corp., along with a full sized statue of Charles Lindbergh. A blue and gold War and a Fairchild cabin monoplane were on exhibit by the American Aircraft Corp. This company gave out cards to visitors redeemable at the flying field for part payment on an air ride. Many visitors were attracted to the field by this method.

The General Aircraft Co. received many compliments upon the Thunderbolt biplane displayed, as this craft, a three plane open cockpit plane built in Glendale, Calif., possessed attractive lines. A full sized photograph of Colonel Lindbergh featured the display of the Ryan Mechanic Monoplane Co. This plane was popular with the crowd because everyone was invited to climb the steel ladder, as integral part of the plane, and try the feel of the upholstery.

The military Wright Whirlwind engine in the Pacific Aeronautics booth excited the preference to see the intricate workings of the power plant. Scientific magazine and Stromberg car-

burriers were also shown here. Scale models and actual flying models featured the display of Short's Aircraft. It was said that several students were signed as a result of the display upon the Warner School of Aeronautics adjacent to the exhibit with a full fact scale model of the new Aero-Craft Engineering Co. "CUP" now being developed. This concern reported that they sold two student courses in the first four days of the show. The year's exhibit was more than twice as large as that shown last year, and it seems hoped that a separate aircraft show will be held annually before long.

Curtiss Building V-1550 Engine Falcons for Commercial Service

THREE CURTISS Falcons for commercial use are now in construction at the Garden City, L. I., N. Y., plant of the Curtiss Aeroplane and Motor Co. The planes will be similar to the military Curtiss Falcons which were designed primarily as observation planes. They will be powered with Curtiss radial V-1550 engines developing 600 hp. at 2400 r.p.m. Provision is made for two passengers in addition to the pilot with the pilot's cockpit in the rear behind a closed cabin for the passengers.

The planes are to be used in the Curtiss Flying Service as well as for the transportation of officials of the Curtiss company. With the equipment required and a commercial payload indicated, it is expected that the Falcons will be one of the fastest commercial planes. The military Falcons have a dashwood tubular fuselage and wood wings. It is a biplane with a large sweep back to the upper wing giving it a distinctive appearance.

Basham Becomes Sales Director With Swallow Airplane Mfg. Co.

ACCORDING TO A recent announcement, Mr. Basham has left the Warner Aerial Co., Muncie, Ind., to become sales director of the Swallow Airplane Mfg. Co. at Wichita, Kan. E. L. Stephens, reserve lieutenant and commissioned officer in the National Guard, has taken Mr. Basham's position of chief pilot with the Warner company, which is agent for the Swallow plane in Indiana, Ohio, Illinois, and Kentucky. Basham has been with the Warner Aerial Co. since its formation three years ago. In 1927, he sold 10 Swallow planes.

Because of constant airplane sales men desiring to learn business of aircraft company new plane school. Two Cox Swallows, one with 200 hp. Hispano-Suiza Swallow, and one Thomas-Morse for steel work will be used for instruction.

United Airways Formed in Detroit To Bid for Michigan Air Mail Line

PREPARATORY TO entering a bid for the air mail contract linking Detroit with a number of other Michigan cities, the United Airways of Detroit has filed incorporation papers in Lansing. Capital stock is listed at \$250,000.

Bids for the contract have been advertised by the postal department and are to be opened about April 30. Service is to begin within 60 days after the award. Some of the cities on the proposed route are Flint, Bay City, Lansing, Grand Rapids, Battle Creek, and Kalamazoo.

J. A. Conner, president of the Detroit Flying Club, is president of the United Airways, Inc. Herbert J. Sewell is vice president, Walter C. Sewell, secretary, and Geo. C. W. Harsh, treasurer.

The WHIPPOORWILL

POWERED WITH THE WRIGHT WHIRLWIND



A closed type biplane with pleasing lines ... a performance that satisfies ... and fully equipped. For complete information write or wire ...

THE LAIRD AIRCRAFT CORPORATION

Wichita, Kansas

Minor Changes Made in Design Of Mohawk Pinto Using Anzani

A SUMMER of minor changes have been made in the design of the Mohawk Pinto since it was described in *AVIATION* last November. As the Detroit Air-Cat engine is no longer available in question, a detachable engine mount has been installed and the plane will be sold at a lower price, because of the engine. The first plane in which these changes have been made is to be powered with an 89 hp. Anzani engine giving a better performance than the former lower-powered installation. The motor of gravity is lowered by having



Clear up showing the seating arrangement of the Pinto fitted with an 89 hp. Anzani engine.

the main fuel tank in the wings instead of behind the engine in the fuselage. The wing tanks are 20 gal each, in addition to a small gravity tank in the fuselage. Welded steel tubing is used for the tail surfaces and the baggage compartment has an opening to the left of passengers' cockpit instead of outside the fuselage. It is planned to replace the 26 in. by 4 in. wheel with 24 in. by 4 in. wheels. Wheels are now being designed for installation as a snap-on.

In the latter part of January the Mohawk Aircraft Corp. of Minneapolis, Minn., elected a new board of directors as follows:

Reuben E. Reed, Stanley Purdine, Norman Wernicke, W. C. Cunningham, G. A. MacDonald, Elmer Smith and S. E. Whitney. Shortly thereafter the following officers were chosen: Stanley Purdine, president; W. C. Cunningham, vice president and chief engineer; G. A. MacDonald, vice president and chief pilot; Norman Wernicke, general manager; and S. E. Whitney, secretary and treasurer.

S.A.E. to Hold Two Day Session During the Detroit Aircraft Show

TWO DAYS, April 17 and 18, are now set aside for the meetings of the Aerometric Division of the Society of Automotive Engineers at the All-American Aircraft Show to be held in Detroit, Mich., April 14 to 22, inclusive.

It is planned that on the first day the group will visit Ford Airport in the morning and spend the afternoon at the Aircraft Show. This will be followed by a dinner at the Book-Cadillac Hotel after which Prof. Alexander Glushko of New York University will speak on the Oxygenated Fuel Aircraft Competition. Prepared discussion by a number of leading engineers will take up the rest of the evening.

The following morning, Wednesday, April 18, an inspection trip is planned to the Packard Motor Car Co. where there will be an exhibit of aircraft engine under construction and on block test. During the afternoon there will be an open meeting of the various sub-divisions of the standards

committee at the Book-Cadillac. Reports will be presented on standards for propeller hubs, engine mounts, pressure mounts, tail shaft shoes, airframe storage batteries, control linkages, airframe tubes, flanged supports, monomethyl fuel and oil pipe dimensions, stream line steel tube dimensions, and a number of other special parts of interest to several manufacturers. The reports of these various committees will be distributed beforehand to all manufacturers and an open discussion will be held on these reports as well as on accurate standards of ground. Following the open session there will be a meeting of the Aerometric Division of the Standards Committee to give an the reports of the sub-committees which will be presented to the Standards Committee in June for adoption by the society.

Name L. M. Boggs as New York State Area Aircraft Inspector

APPOINTMENT OF a new aircraft inspector for all of New York State outside of New York City has been announced by W. B. Jones, inspector for New York State, New England, and New Jersey. The new inspector, who will have his headquarters in Buffalo, is L. M. Boggs, former Army aviator and former foreign patrol aviator. Mr. Boggs was trained at Rockwell Field, San Diego.

Among the planes inspected by Boggs on his recent visit to Syracuse was the first rubber plane to be built in Central New York. It has been completed by Robert J. Hogan, Jr., and will be given a test flight shortly.

The plane was constructed in a barn at Skaneateles, near here. It is a monoplane of the four passenger type with motor seats and with cockpit all the standard equipment of other rubber craft including a heater, shutoffs, split type landing gear, etc. According to expert opinion it is so lightly constructed that it can be powered with an OX-5 engine. The plane is 25 ft. long, has a wing spread of 41 ft., and a wing surface of 552 sq. ft.

Newly Formed Old Colony Airways Will be Eaglerock Airplane Agent

OLD COLONY Airways, a new operating company organized by Springfield, Mass., was recently announced here. The company will conduct a day job and student business at Middle Field, Haverhill, Mass. It will be an agent of the Massachusetts Airways of Springfield and will handle the Eaglerock planes for which the local owners in the New England and Eastern Canada districts.

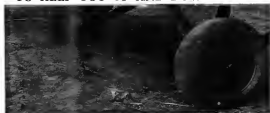
Edmond F. Parker is president of the new concern, Edmund J. Railroad, Jr., is vice president, and Joseph E. Knappe, of the Massachusetts Airways Co., treasurer. Flying operations are expected to start about May 1 when the company's base on the field will go into effect. The names of the pilots who will fly for the company has not yet been disclosed.

Westinghouse Conducting Spray Tests on the Micarta Propeller

WITH A view to developing an efficient propeller for airplanes the Westinghouse Electric and Manufacturing Co. is conducting at its East Pittsburgh Works tests on the water effect of spray on Micarta propellers. A model propeller, with and without metal tipping, is being run at 4000 r.p.m. in a spray of water from a perforated pipe to determine the most effective measures to be taken.



TO HELP YOU UP AND DOWN AGAIN



IMAGINE—dropping an automobile on two wheels! Yet airplane tires take that, perhaps many times a day. Even a perfect 3-point landing gives the tires two-thirds of the job, and more than that when the eye is bad or the field worse.

So, from the word "Contact" back to the hangar you must have tires that will help you up and then help you down again. Goodyear Airplane Tires do both. They roll easily and smoothly over soft or

lumpy ground. And they'll be sound and buoyant when you level out for the finish.

Goodyear Airplane Tires are made to fit the weight and character of the ship; to stand the gaff of "Emergency Fields" and be ready for work in the morning.

The very best materials, and an experience older than aviation, go into every Goodyear Airplane Tire. And into every other airplane part that Goodyear makes.

Aerometric Department

THE GOODYEAR TIRE AND RUBBER COMPANY, INC., AKRON, OHIO

GOODYEAR
AIRPLANE TIRES

Unger Aircraft of Madison, N. J., Named Distributor of Travel Air

THE TRAVEL Air Mfg. Co. of Wichita, Kan., has recently appointed Unger Aircraft, Inc., of Madison, N. J., as distributor for Travel Air planes in Southeastern New York and in the State of New Jersey. It is planned to operate several flying fields at different points in the latter state.

Kenneth E. Unger, World War ace and first lieutenant in the U. S. A. F., will be president of the new organization. Unger was officially credited with one enemy plane and one balloon and was awarded the Distinguished Flying Cross. Since the war he has been engaged in commercial aviation in this country, having flown the air mail over the Rocky Mountains for five and one-half years.



Kenneth E. Unger

The territory allotted to Unger Aircraft will be divided among several dealers. It is planned to operate from five or six fields, and at these fields flying instructions for purchase of planes as well as service for private owners will be available.

A pair of Travel Air planes has already been sent from Wichita and a second set will be shipped shortly after the first of April. All planes of the first order, except one, have already been sold and will be delivered to their owners immediately upon arrival. These planes are powered with the OX-5 engine, while several of those in the second set will be equipped with the Hispano-Motors engine.

Grays Harbor Airways to Produce New Three Place Santa Ana Plane

J. O. YORK, designer and builder of the new three-place Santa Ana school cabin monoplane, has announced that all rights and equipment of the Santa Ana Monoplane Co. have been purchased by the Grays Harbor Airways of Aberdeen, Wash., and that a factory is now being equipped in Aberdeen for the production of these planes on a quantity schedule.

This plane, which was constructed at Edie Meritt's Airport, Santa Ana, Calif., breaks itself admirably to quantity production and parts replacement, thus holding fair to become one of the popular light planes.

The "Aeroline," as this plane is to be called, possesses many features of a novel nature such as adjustable struts which vary with the wing curve, quick adjusting stabilizer that may be used to fly the plane without loading the elevators, and a hand brake lever on the left of the pilot's seat. The most important feature of the design, however, is a unique interchangeability of parts. By using bolted-on wing tips, the two wing panels are made interchangeable, the struts

are full length of the wing panels and are also interchangeable, both main and auxiliary wing struts are interchangeable, landing gear assembly, left and right, struts and rollers, and many parts of the control system are also interchangeable. The result is a materially reduced number of inventories in manufacture, less different parts to build and consequent lower production cost. From the dealer standpoint it is only necessary to carry one wing, one struts, one tail section, one small and one large wing strut, for any optional replacement.

Wasp Engine All Metal Monoplane Being Built by Cincinnati Company

THE BALPIN Development Co. of Cincinnati, O., of which Thomas E. Balpin is the president, is constructing an all metal monoplane that is expected to be shown at the United Aircraft Show. Powered with a Pratt & Whitney Wasp engine the "Flamingo" is designed to have a high speed of 140 m.p.h. and a cruising speed of 120 m.p.h. giving a range of 2000 mi. with a pilot and five passengers. It has an unusually broad high wing constructed entirely of duralumin. Steel tube construction is used for the fuselage with sheet brass braced to duralumin struts to clips on the tubes.

Thomas E. Balpin was formerly chief engineer and assistant general manager of the Steel Metal Airplane Co. of Venice, the Ford Motor Co. In the design of the plane he was assisted by Ralph E. Grindler, now chief engineer of the Balpin Development Co., and Walter C. Clayton, who is in charge of production. An agreement is now being formed which plans to put the Flamingo into production.

Travel Air Mfg. Co. Now Producing Biplane With 125 hp. Ryan-Siemens

PRODUCTION IS being started on the Travel Air type 9000, standard biplane powered with the 125 hp. star cylinder, Ryan-Siemens engine. The engine has more power than the OX-5 and is lighter. It is stated that when installed on the Travel Air biplane it is not unlike the airplane. The exhaust runs into an air duct carried under the fuselage fitted with an air heater connected to the cockpit. A 60 gal. fuel tank is provided as standard equipment giving a range of 600 mi. With this engine the plane, which is identical to the Travel Air "Whisper" biplane except for the engine mount, is claimed to have a high speed of 100 m.p.h. and a landing speed of 42 m.p.h. carrying full load. The useful load is 900 lb. and as the plane weighs 1250 lb. empty it has a gross weight of 2150 lb.

Full Lighting Equipment Installed At Watson Airport, Cincinnati, O.

WATSON AIRPORT, Cincinnati, O., has been equipped for light-to-day night landings, according to a recent report. Its pilot house is visible for 33 mi. under good atmospheric conditions, and field lights are numerous in all sections of the grounds. When, on dark all night, one ready of all lights to switch on the field lights is response to call from pilots in the vicinity.

The Watson Airport is a private enterprise devoted largely to short trips for the entertainment of visitors. Paul De Winter, general manager, is scheduled to give exhibitions of the airport this summer following his return from Europe. Flares are now being made ready for the spring season operation.



(A) Shows portion of bridge seized by Air Corps for destruction. (B & C) Show damage done by one 1100 pound bomb.

DESTROY THE BRIDGE!

THE SWIFT ISLAND BRIDGE over the Potomac River must be destroyed to make way for a new water reservoir. The Army Air Corps is commissioned to bomb one part of the bridge.

Several 300-pound bombs are first dropped on the target. When the noise and smoke and dust have cleared away, the bridge is still there — almost unscathed.

Next, some 600-pound bombs. More noise, more smoke, more dust — and the bridge still stands, scarred and battered, but still a bridge.

Now — one 1100 pounder — and two whole spans are blown clean into the air, to disintegrate and settle in a crumpled mass. There is no longer a bridge over the Potomac River.

The 1100-pounder has turned the trick.

The new Curtiss Condor is the only American bomber that can carry two of these huge 1100-pound bombs and still meet (yes, and exceed) the new Air Corps specifications for bomber performance.

The CURTISS AEROPLANE

Offices
Garden City, N. Y.

Curtiss

AND MOTOR CO., Inc.

Factories:
Garden City and Buffalo, N. Y.

Production Being Started on 40,

60 and 90 hp. Le Bond Engines

THE R. E. LeBond Machine Tool Co. of Cincinnati, O., one of the largest machine tool manufacturers in the country, recently purchased at a bankruptcy sale the assets of the Detroit Aircraft Engine Corp. that formerly manufactured the Detroit "Air-Cat" 60 hp. air-cooled five cylinder radial engine. The Air-Cat will be put into production at the Cincinnati plant of the LeBond company and will be known as the LeBond "Wifty". In addition two other engines are planned to be put into production, the LeBond "Forty", a three cylinder design and the LeBond "Wifty" of seven cylinders. Later on larger engines will be built.

Production efforts will first be concentrated on the 60 hp. engine in an effort to catch up with orders received prior to the recent change. The engine will be very similar in design



An artist's drawing of the factory of the R. E. LeBond Machine Tool Co., Cincinnati, O.

to the Air-Cat and it is understood that the LeBond Wifty will be identical to the Air-Cat except that it will have reduced valves. Complete technical information on the details of these engines will be available at an early date.

A production of 600 engines this year is planned by the LeBond company, but purchasers who require engines prior to July 1 are wanted to place their orders immediately, as deliveries before July 1 of only a few engines more than those now on order may be guaranteed. The plant of the R. E. LeBond Machine Tool Co. at Hyde Park, Cincinnati, has over 350,000 sq. ft. of floor space of which 20,000 sq. ft. is now being turned over and equipped with special tools for producing the LeBond Forty, Sixty, and Ninety.

In a recent announcement it was stated that prior to the sale, the LeBond company acquired the services of Glenn D. Angle and his associates who were responsible for the development of the Air-Cat. With this experienced organization and the facilities of the R. E. LeBond Machine Tool Co. the industry may expect a quality product at the very lowest possible prices. R. E. LeBond will personally devote much of his organization and executive ability to making the LeBond Aircraft engines which are so well known in the aircraft industry as the machine tools which his company has been producing for thirty-one years. His son, Richard E. LeBond is also active in the aircraft engine development.

New York Company is Making OX-5 Engine Starters Weighing 30 lb.

AN ELECTRIC starter for Curtiss OX-5 engines weighing only 30 lb. without battery is now being marketed by Free Bottom Craft, Inc., New York City. The starter was developed originally for installation on the Whorline, a free bottom boat using an OX-5 engine, and it was not until lately that it was installed on an airplane. These starting units have been purchased by a number of companies including Alexander Industries, Inc., Lexington, Kentucky, Johnsen Airplane & Supply Co. and the American Eagle Aircraft

Corp. In addition a number have been installed on free bottom boats, three of which have been in use for over two years.

The starter is made up of modified Ford starting parts supported on four braced duralumin castings manufactured by the Alexander Co. of America in the design of Free Bottom Craft, Inc., and assembled in the shops. The sprocket and ring gear is bolted to the inner face of the propeller hub, using the same bolts that come with a standard OX-5 hub since the metal is not thick enough to require new ones. The whole unit, including castings, starting motor and ring gear, is stated to weigh just under 30 lb. In the free bottom boats a Ford battery is used but for airplanes a battery has been developed in cooperation with the Ertle Co. It is a 25 plate non-spill battery, conforming to Navy specifications and weighing slightly less than 40 lb. The battery is stated to give over 10 to 20 starts without recharging. On the boat installation a governor is provided for charging the battery, which, in addition to starting is used for lighting.

Captain Hinchliffe Believed Lost In Storm Which Swept Atlantic

THAT CAPT. Walter G. R. Hinchliffe and the *Essex*, Essex Mosley, his passenger, had perished in the North Atlantic in an attempted non-stop flight from England to America yesterday morning as American pilots in the Flying in Stripes monoplane Endeavour, Hinchliffe left Cranwell Aerodrome, England, early Mar. 25 and was last seen as he passed a liner 270 mi. off the Irish Coast.

Belief that the monoplane was lost in a great storm reported to have swept the North Atlantic on Mar. 24 gave more credence daily. Though many rumors have been uttered of a plane being heard in Northern Maine and along the coast of Eastern Canada, none has been found to have weight.

Capt. R. B. Miller of the liner *Republic*, which docked at Boston Mar. 27, stated that on Mar. 24 a terrible westerly gale was encountered 1,200 mi. off the Coast of Ireland. The wind velocity, the captain said, reached 70 m.p.h.; and the storm was accompanied by snow and bitter cold, the conditions being impossible for airplane travel.

Regardless of this, however, the Canadian Government placed a search for the Endeavour in the North Maine woods from which the majority of rumors of hearing the plane have come.

New Minneapolis Company Begins Four State Fairchild Distribution

WITH A Fairchild Cabin Monoplane now being demonstrated to prospective buyers, the Mid-Plane Sales and Transit Co. of Minneapolis, Minn., Fairchild distributor for Minnesota, the Dakotas, and Northern and Western Wisconsin, is now well under way in business. The company, formed early in January, is well financed by the leading Minneapolis businessmen who organized it.

The company plans to sell the Fairchild planes to large mining and lumber firms whose interests are at least partly now easily reached by airplane, says Mr. Lester. The Mid-Plane Sales and Transit Co. may enter the passenger and express business.

M. J. Boschee is president of the concern, Mark W. Hart, vice president, and general manager, and James H. Porras is secretary and treasurer. Ralph H. Reed is chairman of the board of directors upon which Glen M. Waters and Willie W. Osburn serve in addition to the previously named officers of the company.

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B.B.T. CORPORATION OF AMERICA



Last Minute Briefs

What is termed a coast to coast commercial flight is now being made in a six passenger Stinson-Douglas monoplane. The flight is sponsored by the New York American and is financed by the outlay of complete radio equipment designed by the Radio Corp. of America. It is hoped to effect continuous telephone and telegraph communication with the ground during the entire flight. Forty co-stops will be made.

The N.A.C.A. convened March 20 an interdepartmental conference to study the subvention and classification of air craft accidents. Represented were the N.A.C.A., War Dept., Navy Dept., and the Dept. of Commerce. At the first conference tentative drafts of definitions and of an outline for sub-division and classification were considered.

Tropical Airways, Inc., has been formed at Clearwater, Fla. The company will act as distributor of Stinson planes in Florida and Cuba. A regular work week schedule to Havana is to be inaugurated soon as well as a general passenger and freight service. Frank J. Smith is president, Ralph R. DeVos vice president and B. L. Stewart is secretary-treasurer.

An International Aeronautical Exposition will be held in Berlin, Germany, Oct. 7-20, 1935, under the management of the National Association of the German Aviation Industry in cooperation with the Exhibition, Fair and Tourism Office of the City of Berlin.

The Westinghouse Electric & Manufacturing Co., East Pitts burgh, Pa., announces production of what is believed to be the first adjustable pitch propeller designed especially for OX-5 engines. It is a Monarc propeller with detachable blades and the pitch is adjustable on the ground.

Air Associates, Inc., New York City, has been appointed Eastern representative for the Lockheed Aircraft Co., Los Angeles, Calif. One Lockheed "Viper" (Whitcomb) is to be demonstrated at Hanger No. 75, Curtiss Field, L. I., N. Y., where the company carries on its air operations.

A new monoplane duplicating an essential aspects of the "Spirit of St. Louis" will be delivered to Colonel Lindbergh at an early date, according to the officials of the B. F. Mahoney Aircraft Corp., New Haven, Conn. Colonel Lindbergh will be the first to test flight the new plane.

Ed Helms, president of the National School of Aeronautics at Kansas, Wis., has taken the agency in that city for Waco planes. He recently obtained a new OX-5 Waco B-13 for instructing the members of the newly formed Hange Flying Club.

The Curtiss Flying Service, Garden City, N. Y., announces that it has renewed its lease with the Airframe Development Co., formerly Reynolds Aircraft, for the operation of Curtiss Field.

The Dakota Airplane Co., Aberdeen, S. D., recently completed experiments and is now in production on a wood propeller designed by W. T. Peltier, master craftsman for new OX-5 and 150 hp. Hmo engines.

Benny Gresh, French parachute jumper, is now connected with the Thompson Bros. Ballou & Parachute Co., Aurora, Ill. He is acting as demonstrator and is carried by J. La Bouché and A. Balmer.

The Curtiss-Robertson Airplane Mfg. Co., St. Louis, Mo., announces that it will be in production on the "Hudson", a three place OX-5 ultra monoplane by July 1. The aircraft factory now being constructed will be completed by May 1.

The B. F. Mahoney Aircraft Corp., San Diego, Calif., will start in San Diego plant for at least one more year and not meet all its activities in St. Louis immediately, according to an official of the company.

Five Fokker Super-Universal (Whop) have been ordered by National Park Airways, Inc., to be placed on the Great Falls-Hill Lake mail route scheduled to be opened about June 1.

W. C. Bush, president Bush Flying Service, has opened a flying school at Vancouver, Wash. Waco and Travel Air planes will be used. A larger is now under construction at the airport.

Proficiency tests having been completed, plans are now being made to conduct a 50 hr. test on the "Dayton Cub", a rebuilt Hall-Scott four cylinder on two row engine engine, manufactured by the Dayton Airplane Engine Co., Dayton, O.

The Tenco Pacific Coal and Oil Co., Port Wadsworth, Tex., manufacturer of AMLO lubricating oil recently published a pilot's log book, copies of which were widely distributed.

The Dallas Flying Club, Dallas, Tex., has called a special meeting for April 6 for the purpose of drafting a state law to regulate aeroplanes within the state borders.

Capt. W. H. Hinkley has joined the technical staff of the American Eagle Aircraft Corp., Kansas City, Mo., and is assisting in the designing of American Eagle planes.

The Airport Engineering Co. has been formed at 583 Mar ket St., San Francisco, Calif. The organizers are Capt. Stan ley E. Moore, Alvin F. Kerslake and Edwin H. Walker.

Texas-Mexico Airways Co. has been formed at San Angelo, Tex., to carry mail, express, passengers, tank flying and oil planes. J. N. Kinard is head of the new firm.

Consolidated Aero Club, Council Bluffs, Ia., has purchased an 80 acre tract of land nearby. A hangar will be erected and service equipment installed immediately.

Bernard Air Lines has been formed at Thompson, O. A field three miles east of the city has been purchased. The Thompson Steel Co. has been awarded the hangar contract.

Production has been started on the first model of the three place Victory biplane at the factory of the Victory Aircraft Co., North Hollywood, Calif.

Capt. H. W. Pinkney has been detailed to the Teleflex (H. J.) plant of the Altko Aircraft Corp. as inspection officer for the U. S. Army Air Corps.

A. A. Kinney is now associated with H. R. Van Dusen, Inc., New York City, as aeronautical consultant engineer.

Capt. C. H. Eidsness is now associated with the Wheel Aircraft Corp., Paterson, N. J.

N.Y. plans to erect an overnight mail and express office to Tulsa, Okla., and Detroit, Mich., before summer.



Waco Leads Again in Pioneering New Production Motors

THE rank of first place in sales, during the entire period of five years, in which WACO planes have been built is due wholly to the conviction of the air-minded that WACO engineering and WACO performance is superior to others in its class.

WACO OX-5 planes have consistently excelled all others in their class and in many cases revealed those costing many times more.

Now WACO engineers, give to the public the same high degree of performance and dependability, coupled with new production motors of higher rated horsepower, Ryan, Siemens, Whirlwind and Camina.

A ride in the WACO Ten with the new power units will convince you that WACO engineering is again a jump ahead.

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MANUFACTURER'S SPECIFICATIONS ON ENGINES AVAILABLE FOR COMMERCIAL USE AS COMPILED BY KATATON

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PLEASANT AIRCRAFT COMPANY
MEMPHIS, MISSOURI



Abstract

The Keystone "Pirate"

Continued from page 775

wings and is reached from the nose of the plane by climbing back a graded floor and climbing up two steps. The instrument board is well arranged and complete, enabling the pilot to tell at a glance the condition of the engine, to regulate using either the Pioneer earth inductor compass or magnetic compass, and to fly by instruments in bad weather. A single control column is arranged with a throw which permits controlling the plane from either of the side-by-side adjustable seats provided for pilot and secondary pilot. The pilot's cockpit is well shielded, so that it is useless necessary to wear goggles. A sliding windshield has been incorporated in the design which can readily be slid out of the pilot's line of vision, thereby aiding in serious night landings.

In the rear cockpit is a complete set of radio equipment for sending and receiving. With this equipment it is possible to pass up stations over a considerable range or receive radio beacon signals. In addition, six horns are carried in this rear cockpit for use in night landings. They are operated from the front cockpit.

The fuselage structure is built up entirely of chrome molybdenum steel tubing with no more bracing. A rectangular section is used with four lag screws and Warren trussing for stress housing. All joints are welded, forming a rigid structure. The tail surfaces are also of solid steel tubing, as are the struts of the lower wing as far out as the engine cowling. The tail surfaces are of conventional shape with both rudder and elevator being balanced. Unlike the previous experimental models of this type, two rubber bands are used in the struts behind each propeller.

The bracing of the wings follows Keystone practice for planes of this type, being of single bay design with struts from the upper fuselage lag screws supporting both the upper and lower wings. The struts to the upper wing, as the outer section struts, have an additional diagonal member, making what is sometimes known as an H strut. The struts in the lower wing have struts in the ribs for longitudinal bracing. These lower struts extend from the upper fuselage

to either engine from any of the three tanks. The cowling are located above the lower wing with the cowling of the engine facing into the upper surface of that wing. The cowling is shaped so that where it meets the wing there is a sort of bluff, which tends to reduce eddying around the nacelle. At the rear, the cowling tapers to a point and is faired into



Side view of the "Pirate", an Army Air Corps bomber manufactured by the Keystone Aircraft Corp.

the wing. The inductor is mounted below the engine with a wire leader at the top above the engine. Metal popovers are employed.

An also mechanism is used in both the landing gear and tail skid to absorb the shock. The wheels of the landing gear, which are of the Bendiside type fitted with knuckers, are each supported below the engine nacelles with two members attached to the wing spars at the wing support strut points, so that the load is carried to the fuselage. The third member is hinged to the lower fuselage lag screw at the point of attachment of the forward wing spar. The tail skid is mounted on a rollers fitted with the also mechanism at the top and braced at the bottom by two members hinged to the lower lag screws. In addition, an emergency skid is welded to the tail post in the event of the failure of the main tail skid.

The plane is said to have exceptional performance, though definite data is withheld at this time at the request of the Army Air Corps.

Elmer G. Sperry Donates World's Most Powerful Beacon to Chicago

CALLED the largest searchlight beacon ever placed, a great revolving searchlight developing 3,200,000,000 candlepower is to be placed on a Chicago skyscraper at a cost approximating 10,000,000. The beacon is a gift to that city from Elmer G. Sperry, head of the Sperry Gyroscope Co. of Brooklyn, N. Y., according to an official of the National Air Transport Co. It is to be ready for operation some time this year.

A 1,528 ft. tower is to bear the beacon, thus increasing the total height of the light with skyscraper on which it will rest to 300 ft. higher than the Eiffel Tower in France, which is now the tallest structure in the world. A beam 63 in. in diameter is to send the light rays 250 to 300 mi. in each radial direction, said. Present standard beacons in use on air and water are visible from 40 to 75 mi.

The Sperry company recently placed a 450,000,000 candlepower beacon on the Hotel St. George in Brooklyn. This is now guiding them who approach the Manhattan area.



FRANK B. HAWKS, who won the Detroit "News" Trophy at the Spokane Air Races last September, carrying a 1,000 pound pay load in his Ryan Brougham, the "Gold Bug," wrote us in November: "I have now completed 550 hours flying with the 'Gold Bug' and it is as staunch as ever, running like a watch, always ready to go. It will land wherever I want to put it. The Ryan Brougham is a wonderful performing ship, built to stand plenty of hard knocks.

I know, because I have put the ship through the mill." Since writing this, Hawks has brought the total flying time of his Brougham to 458 hours, and the plane has required no attention. This is typical "Ryan Brougham performance. In dependability... speed... maneuverability... luxurious comfort... economy... this plane sets the pace, as would be expected of the liner of the "Spirit of St. Louis." Equipment is complete and fine in every particular. Write or wire.

*U. S. Dept. of Commerce Approved Type Certificate No. AT 24

The B. F. MAHONEY AIRCRAFT CORPORATION, San Diego



Rear quarter view of the Keystone "Pirate"

lag screws to the lower wing spars at a point under the engine nacelle. The rubber bands have struts in the ribs for bracing. Except for that portion of the lower wing between the engine and the fuselage, the internal wing structure is of wood, employing built up box spars and wood-on-ribs. Both upper and lower wings have a plan and section. The overall span is 37 ft. with a dihedral of 25 degrees and an aspect ratio of 10.

Gasoline is carried in three tanks located in the center section of the upper wing; the tanks have a combined capacity of 300 gal. The gasoline feeds to the engines by gravity, and by means of a simplified system of control valves fuel may be

The Department of Commerce Requirements

Continued from page 775

by multiplying it by .85. Thus the low incidence factor is to be taken as 85 per cent. of the high incidence factor but in no case may it be less than 3. In inverted flight and slow diving the factor is to be taken as 40 per cent. of the high incidence factor but in no case may it be less than 3.

For single-engine planes the gross weight of the plane must be divided by the rated horsepower of the engine to ob-



Landing with 2100 lbs = 6
Fig. 2

tain the figure of pounds per horsepower. In multi-engine planes only that horsepower required to maintain level flight need be taken. It is difficult to determine this quantity without wind tunnel tests of a model airplane. However the following rule may be used with fair accuracy:

H.P. (required) = $W \times V \times L/D \div 315$

in which

W is the gross weight of the plane.

V is a speed in miles per hour—the amount of which may be determined by adding to the stalling speed of the plane as figured one-third of the difference between the maximum

and stalling speeds. This will give very closely the speed of the plane in maximum horsepower.

L/D is the efficiency of the airplane and should be taken as 7 for ordinary biplanes and 6 for monoplanes. These L/D values are low but satisfactory jobs are usually well over these and at lower values are more conservative. It is thought best to use them.

Knowing our horsepower loading and the gross weight of the plane we may now read directly from Fig. 1 the required high incidence factor. Supposing we had a plane weighing 2700 lb. with a Whitehead engine rated at 225 hp. Our loading is $2700/225 = 12.00$ lb. per hp. Since our weight is 2700 lb. we take the point midway between the 3000 and 3600 lb. line and on a vertical line passing through the 12.00 power loading reading. This point has a value of 6.32 on the side scale and so that is our high incidence factor.

The low incidence factor is $6.32 \times .85 = 5.36$.

The inverted flight and diving factor is $6.32 \times .40 = 2.53$.

Table 1 gives the load factors for the landing conditions, the height of free drop required for landing gear design, and the required design load for the tail surfaces.

Table 1.—Load Factors

From Power loading table in p. 794	Load condition	Height of free drop required (ft.)	Factor for tail surface
2.00	1.00	10	1.00
2.50	1.25	12	1.25
3.00	1.50	15	1.50
3.50	1.75	17	1.75
4.00	2.00	20	2.00
4.50	2.25	22	2.25
5.00	2.50	25	2.50
5.50	2.75	27	2.75
6.00	3.00	30	3.00
6.50	3.25	32	3.25
7.00	3.50	35	3.50
7.50	3.75	37	3.75
8.00	4.00	40	4.00
8.50	4.25	42	4.25
9.00	4.50	45	4.50
9.50	4.75	47	4.75
10.00	5.00	50	5.00

The stress shock absorber shall be designed to absorb the energy corresponding to the free drop listed above without

subjecting the chassis to forces greater than those corresponding to the load factors in landing. The tailhook shock absorber shall be designed to resist a free drop in the three-point landing attitude equal to that listed above without imposing loads on the shock or fuselage greater than those corresponding to the load factors for landing. If a shock absorber is required to dissipate the energy of the free drop by the fire of liquid through an orifice—the also or also-pneumatic type of absorber, it must—be the load factors required in the landing maneuver may be reduced out to a maximum 25 per cent. When this type of shock absorber is used suitable provision must be made to carry the shocks due to landing after the shock absorber has been forced to the full extent of its travel. The method to be used must be clearly shown or described on the chassis drawings. No reduction may be made on the required height of free drop for the shock absorber.

Elementary Theoretical Consideration of Load Factors.

These are four important flying conditions for which the wings of a plane must be analyzed. These are high incidence, low incidence, inverted flight, and slow diving. These conditions all come when going through a steep dive followed by a pull-out as illustrated in Fig. 3.

As the plane is moved over to go into a dive it still has a large forward velocity and the relative wind strikes the wing on its upper surface. The loads on the spars are then acting down instead of up as in normal flying. This is known as the Inverted Flight condition.

As the plane straightens out on its diving path, with the wing nearly vertical, it is moving very rapidly at a small negative angle to the relative wind. Its speed is great because



the lift of the wing is small, and the weight of the plane is balanced to a large extent by the drag alone. In the Diving Condition the entire weight of the plane is assumed to be taken up by the drag.

Just after the pilot starts to pull the plane out of the dive the angle of attack of the wing is increased slightly so when it is known as the low incidence angle of attack. This is the angle at which the airplane would fly horizontally when making the maximum speed. However the speed near the end of a dive is far greater than the maximum horizontal speed of the plane and consequently the forces acting on the structure will be greater. The large lift that the plane has at this point is counter-balanced by the centrifugal force of the machine acting away from the center of curvature of the flight path. Thus the forces acting are in dynamic equilibrium. The factor for Low Incidence is obtained at this point in the dive.

As previously stated the condition which probably imposes the most severe loads is the High Incidence condition. As the pilot pulls the plane out of the dive the angle of attack increases. When the plane again approaches the horizontal, the angle of attack of the wing may approach the "stalling angle" slowly. The speed of the plane at this point is less than the maximum diving speed. Thus the load is partly due to the increased drag at the new angle of attack and partly due to the fact that a plane is not pulled out of a dive instantly without loss of speed but is slowed out in a gradual curve. Nevertheless the speed at this point of the dive is greater than the stalling speed of the plane. As the forces

*The theoretical consideration of load factors is entirely elementary and need not be considered as all but impossible.

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The Siemens-Halske TRAVEL AIR is now available in New York and New Jersey



THE new Siemens-Halske powered Travel Air is a ship of remarkable performance and has powerful Travel Air dependability and quality. It is such a plane as you would expect the manufacturers of the famous OX-5 Travel

Air to build around a new production engine.

Travel Air is the ideal plane for the private owner, for flight instruction, and for ordinary commercial flying. Sheer merit of such finished airplane has made it the standard of comparison.

Unger Aircraft, Inc.
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See dealer's literature or write for complete particulars.

Flight instructor will be available and ground school flying will be held on four several days.

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as a plane very as the square of the speed it is shown that the load factor for the High Inversion machine based upon stall and maximum diving speeds will be very high. As commercial planes are not maneuverable enough to pull out of a dive satisfactorily and as planes are very seldom dived at their terminal velocity, the actual load factor is reduced for any particular plane is less than theoretical computations show would indicate. It is to be noted that as a low incidence the large lift force on the plane is counter balanced by the centrifugal force. This indicates a state of dynamic equilibrium.

The curves shown in Fig. 1 would seem to indicate that the light load factors for an airplane depend to a large extent



Landing with Inverted Reaction
Fig. 2

upon the power loading of the plane. But in pulling out of a dive, we theoretical computations seem to show that the power of the engine has no direct bearing on the loads at landing. The clearance of design and the use of the inverted surfaces are really the criterion of the loads that can be imposed. Clearance of design means little drag and a high diving speed, large control surface means good maneuverability, and a quick pull out from the dive. In actual practice however, the power loading has an important bearing on the load factor. We can imagine a dive undertaken with power as in such a case, the slipstream of the propeller increases the

power of the horizontal outside and the maneuverability accordingly. Also in the initial stages of the dive, before too great a speed has been attained, with engine full-on, the propeller will be causing a positive thrust (it is only at the very greatest diving speeds that the power driven propeller will maintain a positive thrust or act as a brake). There is a powerful engine near to practice be made to increase the evidence of the loads in the diving and pulling-out maneuvers. The power of the engine also has a bearing on the violence of such maneuvers as steep turns, barrel rolls, etc., which are performed with precision. The standard a constant theoretical basis for flight load factors is a load of great difficulty. Fig. 1 is probably not claimed by the Department of Commerce to be an entirely rational basis for the value of the load factor. It is a semi-empirical chart, but as it is based on some ten years of Army and Navy experience, and it is modified to suit commercial needs, it may be regarded as a good basis for the time being. The most severe stresses that will be made of this chart is probably in the fact that an arbitrary distinction is drawn between open cockpit and closed cabin planes. There is no particular reason why for the more conservative and open landing the closed cabin plane should not actually be both faster on the dive and more maneuverable. The Department may have had the idea in mind that in a closed cabin job, passengers might be expected to put aside their safety belts in several flying and that accordingly pilots would take precautions not to maneuver violently.

When an airplane lands it depends upon the skill of the pilot and the character of the field as to whether or not it will receive a severe shock. If the pilot lands the plane at a speed equal to the flying speed of the plane at the corresponding attitude there will be no shock on landing. The landing gear must be designed for conditions where shock is present, and has to be met and absorbed.

A land plane may land in any one of three attitudes. There

are two point landing in which the tail is high and the two wheels touch at once, three-point landing in which the two wheels and tail skid all touch the ground together, landing with side load, which occurs when one wheel is low and one wheel lifts before the other. Also in modern planes, brakes are frequently used and landing gears must be designed to withstand the extra ground friction involved by the use of brakes.

The two point landing or level landing condition as it is called is illustrated in Fig. 3. The propeller axis is horizontal and both wheels are on the ground. At the point of acro-



Landing with Vertical Reaction
Fig. 3

tion of wheel and ground there is a vertical reaction Y and in addition a horizontal force H due to the friction of the ground against the tire. If the resultant of these forces acts up and back, H , the friction of tire and ground, varies widely with the character of the ground. For purposes of stress analysis it has been found best to assume that the resultant R in Fig. 3 passes through c.g. of the plane and the axle and balance the weight of the plane and the dynamic force D produced by deceleration.

The Three-Point Landing condition is illustrated in Fig. 4. In this attitude the plane is at a large angle of attack and the air resistance is so great that the force H due to ground friction is neglected by convention. Just a vertical

force W as shown in Fig. 4 acting down through the c.g. need be taken into account. Since the plane is supported by the tail skid and wheels the load is divided between them in inverse proportion to their distance from the line of action of W . Landing with Side Load is illustrated in Fig. 5. A plane landing after a side slip or with one wing low will induce this condition. As in Level Landing condition there is a force H due to the friction of the tire and a 5000 V acting vertically against the weight. In addition a side force S is imposed at the point of contact between wheel and ground. For simplicity S is taken as one-fourth of V since in actual practice most wheels will sink landing.

The linked landing condition needed only to be considered for planes equipped with brakes. When the brakes are locked upon landing the friction of the tire is greatly increased. Consequently the force H becomes much greater. This is illustrated in Fig. 6. For convenience it is assumed that the tail skid is just clear of the ground. A coefficient of friction of .55 is given the tire. Thus the weight of the plane times the coefficient of friction will give the value of H . V is assumed to act vertically through the axle and is equal to the entire weight of the plane. This is a new condition that has never been required before but with the advent of the modern plane with brakes it seems a real and important.

The regularity of vertical descent at the instant of landing determines the magnitude of the load that is imposed on the landing gear. The shock absorber is designed expressly to maintain this load by absorbing some of it in interval work as by distributing the rest of it over a period of time. A suddenly applied load is more severe than a distributed load. If we are to bring a weight on a spring plane it on pretty gradually raising the weight from ourselves to the spring. The spring will deflect a certain amount as the load is taken by it. If we just bang the weight on and let the spring take all the weight instantly it would mean a shock load and

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would extend about twice as far as in the previous case. The support to which the spring is fastened will receive a much greater load in the second case than in the first. Tail shaft bearings have shock absorbers to lessen the shock loads that are transmitted to the fuselage structure.

United as Table 1 are the heights of free drop from which a fully loaded landing gear may be dropped to test the shock absorber. The heights are selected to cover the maximum condition that would occur in an actual landing. This dynamic or dropping test is better than a static test because in addition to showing whether the members can stand the



maximum loads specified in proving whether or not the specified vertical velocity can be developed by the shock absorbing mechanism, without causing excessive loads to be developed at the structure.

Reactions on the wheels have the same kinetic loads imposed upon them in landing as land planes. The position and rate the water surface on landing and otherwise part of the shock, but this is not nearly as effective as a shock absorber and consequently a higher load factor is required. The conditions to be analyzed for are similar to the land plane conditions. They are known as landing with inclined fuselage which is similar to the Level Landing condition; Landing with Vertical Fuselage which is similar to the Three-Point Landing condition; Landing with Side Load which bears the same name as the land plane condition.

Reactions Landing with Inclined Fuselage is illustrated in Fig. 7. The plane is landed with a large forward velocity. The propeller axis is assumed horizontal and the water surface passes up and back through the ag of the plane. The inclination of the resultant force R is taken such that its horizontal component H is one-fourth of the vertical component V .

Reactions Landing with Vertical Fuselage differs from the Three-Point Landing condition only in that the propeller axis is assumed as horizontal. This condition is illustrated in Fig. 8. The assumption that the propeller axis is horizontal is very arbitrary in a plane in which it is at an angle without having a backward component of force due to the water reaction. In the case of a land plane we have the tail fixed to the fuselage which strikes the water in its. In a seaplane however we have no such point at the tail to take a part of the load. The position must take the entire load and the member is considered to act as a beam and distribute the load between beam struts. The error involved in considering the axis of the portion horizontal is not great and must be accepted until a better method is devised.

Reactions Landing with Side Load is identical with the land plane condition except in the analysis of the members only a side load is imposed on the position and the vertical forces are omitted. It has been found from experience that structures of unnecessary strength and weight result if vertical and side forces are combined in the analysis of the condition. An illustration of this side force is shown in Fig. 9. The force is assumed as one-fourth W , the weight of the plane and a factor of 8 superimposed upon this.

In maneuvering a plane the loads on the ailerons and tail surfaces are greater than in normal flight, and must be built strongly enough so that they do not deflect too much under load. A large load is put on the horizontal tail when a plane is seen diving as shown in Fig. 2. At the small negative angle of diving there is a powerful moment tending to make

the plane assume a still greater negative angle. A down load on the tail is necessary to counter-balance this moment and maintain a steady dive. The loads on the tail surfaces when maneuvered in the fuselage are part enough to cause maximum stresses in some members of the rear fuselage structure.

The loads required in the design of control and tail surfaces are listed in Table 2. A static test in which the specified loads are placed upon the surfaces by means of bags of lead or lead shot is often preferable to an analysis.

It was previously stated that in pulling out of a dive, the airplane forces acting on every part of the plane increased on the center of curvature, counter-balance the momentum.



are considered as being increased by this application of centrifugal force by the value of the load factor for a particular flight condition. In stress analyzing the fuselage for air loads therefore, we must:

- 1) Apply the wing reactions, as calculated which due to increase has been made for dynamic effects on the wings.
 - 2) Multiply the weight of each component of the plane by the load factor.
 - 3) Apply at the tail an arbitrary load such that there is equilibrium for the forces normal to the flight line, and pushing equilibrium about the center of gravity.
- This process is illustrated diagrammatically in Fig. 10. A similar equilibrium condition has to be established for forces along the thrust line. The entire plane has then been reduced to a state of static equilibrium.
- These remarks must be considered as purely of an introductory character. The methods of establishing equilibrium will be given in detail in a later chapter.
- In dealing with the landing loads, the fuselage is subjected to the same reactions as the landing gear, and since the focus is on the landing gear and its reactions on the fuselage have been found, the landing stress analysis of the fuselage follows naturally.

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To be continued in the next issue of AVIATION

Fly Buhl Air Sedan on 6,000 Mi. Round Trip Flight to Oklahoma

PILOTTED BY Louis Meister, sales manager of the Buhl Aircraft Co. of Marysville, Mich., and carrying as passengers Herbert Hughes, general manager, and a mechanic, a Buhl Air Sedan recently completed a tour of 6,000 mi. to the Pacific Coast and return. The trip took 27 days, flights being made on all but one of these.

Starting from the company's Marysville field, Meister flew to Chicago and thence west over the San Francisco bay route. After a visit to the Coast flying centers, the return trip was made by way of San Diego en route through Arizona, California, Nevada, Idaho, Utah, the journey from Little Rock, Ark., to Fort Harn, Mich., near Marysville, was made with but one stop at St. Louis.

Meister reports one sale of a Wright engine Buhl Air Sedan as a result of the trip. Several other sales are reported under negotiation.

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80 H.P.	Normal r.p.m. 1100, weight 310 lbs., 4 cylinders, bore 4 1/8 in., stroke 4 1/8 in., length 24 1/2 in. — price \$1300.00
120 H.P.	Normal r.p.m. 1050, weight 520 lbs., 6 cylinders, bore 4 1/8 in., stroke 4 1/8 in., length 24 1/2 in. — price \$2175.00

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center round taking while the rear strut is 2 1/2 in. diameter. Both members are 960 in. thick and streamlined to the most manner.

The wing support struts are of the "Vee" type meeting at a point below the fuselage at each side where they are braced to each other by a horizontal cross member. The vertical loads are carried to the fuselage by four short members on each side which are attached to the lower longitudinals just below the wing spars and thence to the upper longitudinals at the bearing extending from the point of support on the lower



Showing landing gear, wing bracing, and 150 hp. Elmer engine of the direct drive model

longitudinals diagonally on the other side of the fuselage to the point where the wing support struts meet. The landing gear also hinges about the point as well as about the midpoint of the horizontal cross member. Shock is taken by a short member from the axle to the lower fuselage bracing. The landing gear itself is called semi-spring type in which there is as load on the shock absorbers there is 8 in. more clearance at the outer than at the wheel. In other words the horizontal member between the wing support struts is 20 in. above the ground when the elastic chord of the shock absorber is not under load. The wheels are 25 in. by 4 in. with a 4 in. 8 in. tread. The stress of the shock absorber is such that the wheels travel vertically up and down.

The scheme is so arranged and the control is such that the wing can be taken off without moving any bolts or pins from the control system. The ailerons are controlled as individual units and should one section fail the other would not be affected. Like the elevators the ailerons are actuated by push rods while the rudder is operated by flexible cable. Steel tubing 1/2 in. by 3/4 in. is used for the construction of the ailerons. They have a nice flat top and a one foot chord giving a high aspect ratio contributing to their effectiveness at low speeds. The ailerons do not quite extend to the wing tip giving them a rectangular shape. The elevators are actuated with a control having an easy straight line at points to lead them to automatic position. The stabilizer and vertical fin are almost triangular in shape tapering into the movable control surfaces which are made up entirely of straight lines. The fixed surfaces are braced by aluminum wires. The stabilizer is adjustable from the cockpit while the fin is adjustable only on the ground. The rudder is said to be very efficient on the ground and though the tail shed is not movable it can control allowing the plane to turn in a very small radius.

The Elmer engine is mounted in the nose of the fuselage to a combination of the fuselage structure knurled to reduce vibration to a minimum. No exhaust ring is installed though

on the later models it is understood that a single exhaust manifold will be installed below the fuselage reducing the noise and the place of the exhaust goes to a maximum. The light given off by the burning of exhaust gases is simply very sweeping in night flight or in fog. A glow propeller is provided as standard equipment as is a few subgraders for use in an emergency.

The Simplex Aircraft Corp. seems very enthusiastic about the Elmer engine which is a single five cylinder radial of conventional design developing 180 hp. at 1600 r.p.m. It is fitted with a Zenith carburetor and two Zeitzels magnetos. A stress analysis of the plane has been completed and applications has been applied for with the Department of Commerce for an Approved Type Certificate. O. L. Warden is the designer of the plane. E. J. Allen of the American Steel Package Co. is president of the Simplex Aircraft Corp. with O. B. Roberts as secretary and treasurer.

The manufacturer's specifications are as follows:

Length overall	28 ft. 3 in.
Wing span	32 ft. 4 in.
Wing area	320 sq. ft.
Wing loading	56 lb. per sq. ft.
Wing tip	750 lb.
Wing root	750 lb.
High speed	120 m.p.h.
Cruising speed	115 m.p.h.
Landing speed	40 m.p.h.
Cruising radius (approximate)	3200 ft.
Climb to 10,000 ft.	17 min.
Service ceiling	10,000 ft.
Absolute ceiling	10,000 ft.
Take off with pilot and 25 gal. of gasoline	45 ft.

The design of Red Arrow plane seems very original and it shall be interesting to note their performance when in service. The adaptability of a wing from such as this is desirable and only extensive tests in service can answer the question. The manufacturer claims many advantages such as increased range, lower structural weight, maneuverability, etc. A recent non-aeronautician states "this position of the wing presents a performance that has not been accomplished by any other plane, as far as maneuvering and ease of handling is concerned." However to our knowledge no complete data on the subject is available as practice these restrictions. The only modern plane using this type of structure. Some wind tunnel tests along these lines would prove interesting.

Golden State Aircraft Co. Head Has Sold 60 Eaglerock Airplanes

THE ENVIABLE record of having sold 60 Eaglerock class May 1924 when he took the franchise for that plane's distribution in Northern California, is held by James L. Vetterly, president of the Golden State Aircraft Co. at Oakland, Calif. His business grew to such proportions that an entire room building in Oakland was recently leased for the company. Now, Eaglerocks are displayed in a special show room built for sales purposes.

The Golden State Aircraft Co. not only sells the Alexander plane but also conducts a flying school, serves passengers, does aerial stunts, and provides a repair and service department. The company's staff includes: D. A. DeFure, vice pilot and commercial flyer, Stanley Campbell, and Capt. George D. Berra, war flyer, are the pilots of the company. Flying instruction is given at the Oakland Airport, while ground school is conducted at the Golden State Aircraft Co. building at 2281 E. 12th St., Oakland. A full certificate is taught.



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for the express purpose of organizing an international division of the local economy. Capt. L. M. Woodson, international engineer of the Packard Motor Car Co., was named chairman of the newly organized division. Woodson immediately set a committee to work on with the organization, work was set of June 12 Drugg, president of the Drugg Mfg. Co., chairman, William B. Stout of the Ford Motor Co., William N. Spence of the Stinson Aircraft Corp., Jack Whitaker of the Tuller Oil Co., and Ralph H. Lipson of the Aircraft Development Corp.

Ann Arbor, Mich.

May Thomas O. Leachman, commandant at Selfridge Field, together with Louis Leonard Pio and other officers of the First Pursuit Group, attended the "Airport" location recently given by the students of the university. The location was given for the event "An Airport for Ann Arbor" towards the target for discussion.

Both Major Leachman and Lieutenant Pio recently inspected the proposed airport site south of Ann Arbor, finding the place fine, Major Leachman before leaving expressed his approval of the location.

At an organization meeting recently staged by the students of the university 42 Ann Arbor residents became charter members of the new Ann Arbor Flying Club. The club was formed to promote aviation and the establishment of a municipal airport on the site south of the city.

Leachman Pio has asked permission to operate a flying school at the club's airport.

Salt Lake City, Utah

By E. K. Hale

Whereas at this time last year the field here was marred by a series of depressions filled with water and only a narrow under runway was available for taking off and landing, today the entire 185 acres offers dry ground, the main runway, long, dry and smooth now. The City Commission has expended several thousands of dollars on the field. The summer the work will be completed by installing a drainage system, in addition to more under work. W. E. LaPalme is credited with promoting work on the airport.

A. E. Thompson, retired coast flyer and bombardier, is now flying a new Warm brought home from Guadalcanal having been purchased from the Spanish army there. Thompson is busy with student training and arranging his year's passenger program. He recently sold his Standard which he had used in establishing his flying school. He still flies his Cessna.

Toledo, O.

By David R. Sloan

Fast development of Toledo's new trans-continental route airport will be made in the southeast corner of the 625 acre tract located seven miles southeast of the downtown district. It is between the Leffingwell and Madison roads, the former on the east side and the latter on the west. The portion of the field to be developed immediately will be enclosed with chain link and electric lights will also be placed. Flood lights will be located on the north side of the field midway from the end boundaries. Equipment of the start will include an air pump for use of the N.A.T. line, and provisions for servicing and repairing racing planes.

New sight houses for the Ford flight line between Detroit and Cleveland will be put in operation April 1, according to word from Washington to J. F. O'Connor of the Kansas company here. One will be placed north of the city and the other at Mountcastle and Opaheville. The route is so laid that Toledo can be reached in the line wherever Kansas here operates.

The Lake Shore Aviation Co., Port Clinton, O., has leased 20 acres of the George Stone farm on Bay Shore Road for a new landing field. Hangars are to be built at the west end

of the grounds. The field is on line with the Cleveland-Detroit route of the Ford flight line and near the shores of Lake Erie.

George Wells, head commercial fleet, is negotiating through LSA's for spring passenger carrying. Wells is operating from the Nickerson Ave. Airport.

Ray-Way, Inc., will start on spring flying activities at its field on the main highway between Detroit and Toledo on March 30. Three planes will be put in service immediately and later two new American Eagles will be added to the fleet, according to an announcement by Thomas Martin, president of the company.

Cincinnati, O.

By Charles E. Finch

Recent aviation accidents in the city schools produced three wrong air mail slogans, "Mail Air Mail and Others," "The Speed is There Use the Air," and "A Letter to Time Please Give a Dime." A poster contest produced exceptionally good art work by boys and girls 25 and 18 yr. old.

An aviation show every Tuesday night over WFLM, western Kentucky, and personal collection, are being made to inform Cincinnati business men about the advantages of air mail.

Postmaster Arthur L. Balguyser is now an air mail enthusiast. He has spoken before many clubs of the city on advantages of the system.

Norman, Okla.

By Bruce W. Fox

The Omega, aviation fraternity at the University of Oklahoma, is meeting place for holding of special meetings at the university for holding aviation. The chapter, of which, Joseph H. Hootch is president, also has many other plans under consideration for future publicity work. Addresses were given at the last meeting and general session as follows: Jimmy



Jimmy Hootch, past president of the Oklahoma Air Transport Co. at Norman and member of The Omega, professional class, University of the University of Oklahoma.

Hootch, "Captain Irwin as I Know Him," "The Cannon Engine," by Lee Wilford Gable, "Airplane Production in 1927" by Warren E. Duggan, Earl Wynn's paper on "Wing Construction and Assembly," Orville Gable, "Will Rogers Doors for Aviation," G. C. Caldwell, "Aviation at the Future."

Tulsa, Okla.

The American Society of Mechanical Engineers put on a program recently at the Mayo Hotel here. The leading address of the evening was "Airplane Design" by W. G. Brown of the Spitznagel Aircraft Co. of Tulsa, "Advances in



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Aerodynamics by M. A. Uris, "Commercial Aviation" by William Collier, chief pilot of the Midway Airport, Tulsa, and "Army Lighting" by M. C. Hays of the United States Department of Commerce. A large meeting was held, and all the addresses were enthusiastically received, many others being the engineers being present.

Ponca City, Okla.

W. E. Ross, district judge for Kay and Noble counties, was elected president of the Ponca City Aviation Club, recently organized. H. A. Paul was elected vice president; Alexander Leitch, secretary-treasurer, and Major Malcom, V. W. Sweeney, directors. The members plan to launch flying and gliding beside making Ponca City one of the good airports in Oklahoma, it having shown remarkable growth during the short time it has been in operation.

Martinsburg, W. Va.

Headed by Alexander R. Paul, airport engineer, the A. B. Pauls Co., airport engineers and builders, have started operations here and, among other contracts, will construct a modern airport at Henson, Md. Associated with Mr. Paul is Earl W. Balise, a civil engineer and an expert steel constructor who has been widely interested in aviation and who has had considerable experience in supervising landing field work.

Mr. Paul has been active in aviation since 1915 when he began experiments with gliders. He later entered the Army Air Service in establishing fields where the system of model aircraft was inaugurated.

The company's work includes the construction of hangars, the establishment of airports, as well as light installations, aerial photography, and mapping. Several veteran aviators are partly associated with the new organization. Randolph Field, the local airport, was established in 1921 at the request of the Army Air Service as an intermediate field along model runway No. 2 from Dayton to Washington.

Little Rock, Ark.

By Joe Berry Foster

An aviator has entered the race for governor of Arkansas. He is J. Carroll Gore, present state auditor and a major and commanding officer of the 34th Observation Squadron, Arkansas National Guard. Several years ago he made his state auditor campaign in a J. Carrol, and now, being connected with a local aviation company, he will make his campaign for governor in a plane of more modern construction.

The House Insurance Co. here is interested in aviation; for beginning with T. C. Owen, who acted in his home, as an aviator, has taken up aviation. There are several other companies of the county with applications to the commercial inspectors and several more already flying.

Porter Wilson, Ford dealer and aircraft dealer of Hot Springs, Ark., and his staff of six mechanics are all learning to fly at the same time. Mr. Wilson is preparing his firm for the increase in aircraft business by training all his employees now.

Boise, Idaho

By Arthur H. H. H.

The recent presentation of a home production, "The 1935 Vanderbilt Home," by the Boise Flying Club in the high school auditorium was a huge success, not only in attendance but financially as well. The proceeds are to be added to a fund for the purchase of a dual-control biplane, for the club's use in flying instruction.

The veteran airplane mechanic, Chris DeValkow, now in the service of Vancay Air Lines and stationed at the Boise Airport, will teach members of the Boise Flying Club the second phase of their study, which deals with airplane engines.

A number of the high school faculty, Charles F. Hunsicker, will assist DeValkow as well as Walter I. Boyd, both of

Boise are club members and experienced engine mechanics. The course follows the one in dynamics which has been conducted by A. J. Rouse, former Army Air Corps instructor.

Milwaukee, Wis.

By R. C. Rouse

A number of there were the guests of Stuart F. Auer recently at the University Club. Among those who attended the dinner were John Curry, O. G. Bading, John W. Laska, Paul M. Dutton, Frank G. Wadsworth, Alvin McFarlane, Don Kiser, William G. Williams, Gordon E. Rame, and Robert Hanson, William Kinsley, Joseph Whyte, and Nevill Leach. Mr. Kinsley came from E. Goodbridge, Mass., he and Don Kiser, Milwaukee, being old friends. Other leading pilots who started for Milwaukee by plane had more varied and because of the mild weather were Edward W. Knepp, Vandalia, Mo.; Elton White Springs, Evansville, Ind.; O. J. and John Livingston, Minneapolis, Minn.

Very many of lighted airports are under the impression of it Milwaukee pilots are included in any other office in the country according to I. B. Marshall, associate surveyor. Men working out of here were taken to Rayon, O.; Omaha, Neb.; Wichita, Kan.; Fort Worth and Dallas, Tex.; and St. Louis, Mo. This represents a total of more than 2,000 on a typical average in excess of the number included out of the Salt Lake City bureau.

Roanoke, W. Va.

By Frank Leavelle

Dr. George Ross, owner and founder of Air City, Roanoke's airport, has completed construction of a club house and dormitory for pilots and visiting aviators. Offices for flying school and transport company officials also will be constructed. Dr. Ross also is beginning construction of an observation tower to be built over the 12 plane hangar.

Two Ross real estate agents have made provision for completely landing fields in the center of plots which they intend to open soon.

Thomas Waters and George Jenkins have reconsidered a trip in which they intend to fly south April 1 on an all summer barnstorming tour.

Waukegan, Ill.

By Duane Adams

An new club headed by the Waukegan Chamber of Commerce, local business men and manufacturers, is being organized at Waukegan. At a recent meeting, 50 men and women signed applications for membership and from the general outlook, it is expected that between 75 and 100 people will be added for charter membership.

A house has been offered the new club, on a large field near town, which is now being used for flying purposes, and it is planned to accept this as soon. Repair shops will be set up immediately afterward by a local company, and hangars and planes will be purchased by the club at an early date. Larry Elmore, who has the Waukegan airport in this country, has been elected temporary chairman of the committee appointed to select the airport site.

Hartford, Tex.

At a recent meeting in this town, a group of flying enthusiasts organized a club called the "Hartford Aero Club," as it is called, is designed to take all members, all the time in this town which is known as the "Lower Rio Grande Valley of Texas," and includes Brownsville, Raymondville, El Paso, and McAllen.

The officers elected were president, Jack Thompson of San Antonio, Tex.; vice president, Roy W. Butler of Hartington; secretary-treasurer, W. E. Benton, of Hartington. The object of the club, as expressed in the constitution, is to "advance aviation in the Lower Rio Grande Valley of

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used by giving instruction in flying, by demonstrating in formation on the subject of aviation, by conducting a general school, and a series of lectures for the audience, and by holding a meeting place for students, young and old.

The instruction will be under the supervision of Frank F. B. Key, graduate of Kelly and Brooks Field, San Antonio, and will be given largely on the field of the Valley Airway Co. in Harrison. The regular class meetings are set for the first and third Thursdays in each month. Quota are welcome.

Beaumont, Tex.

By Arthur E. Nell

Extension of the Beaumont Municipal Airport has been started by workers under the direction of City Park Superintendent Frank L. Berthold. Plans for the extension were recently approved by W. O. Snyder, superintendent of the Airway Extension Bureau of the Department of Commerce, who made an inspection of the facilities.

The local field will be increased from its present size of 1200 by 1000 ft. To make the airport available at all times, security of needed aid will be maintained for use in winter. Rhyme, language, and a dark room will also be built. No shelter is available on the field at the present time.

The field adjoins a municipal golf course on the west side of the city and is free from all obstructions in the way of nearby high lands, buildings, etc.

The formation of an air club is being planned by the board of directors of the local chamber of commerce.

New Orleans, La.

More than 60 students recently banded together here to form the Aero Club of Tulane University. This marks the twenty-third of the first college aero club in the South. Albert E. Holloman, director of Tulane student activities and Bureau was first, was presented with a charter for the club by J. B. Trivette, president of the Louisiana Aero Club.

In a recent visit to the Municipal Airport, the members of the college organization were taken for flights by William N. DeWalt, operations manager of the MC Tammery Gulf Coast Airways, Inc., the company's Public Universal.

Shamokin, Pa.

Formation of the Shamokin District Aero Club being organized by the local chamber of commerce, the club has now purchased property on which an airport will be established with the opening of the winter season. According to plans, the airport will be well equipped.

Shamokin is located near the direct line course of the New York-Chicago Air Mail Route. It is also favorably situated in the path of a route considered between Philadelphia and Seattle.

Orlando, Fla.

By R. T. El

The north and south runway of the new Orlando Municipal Flying Field now closed.

Six students are now enrolled in the Orlando Airway Flying School, First Road at Leesburg, Fla., being nearest graduation. With the completion of the course, they will intend to buy a Waco 18 from Lewis E. C. Wilson, president of the Orlando Airway, Inc., and state distributor of the Waco planes.

Kansas City, Mo.

By R. T. El

The American Eagle Aircraft Corp. has announced recent orders for 15 planes. Six are for delivery in Oregon, three in New York, and one each in Michigan and Illinois.

The Bennett Flying School, located at Bethesda Field, is a record of graduating six first a week since it started a year and one-half ago. Thirty students are now enrolled.

UNITED STATES AIR FORCES

Require Kelly Students to be Observers

Under a new policy inaugurated at the Army Air Corps Training Center, students prior to graduation from the Advanced Flying School at Kelly Field, San Antonio, Tex., will be required to qualify for the rating of Airplane Observer in addition to that of Airplane Pilot.

A new system of training has gone into effect at the Training Center under which all student pilots at the Primary Flying School at Brooks Field, San Antonio, Tex., and Maxwell Field, Birmingham, Calif., will be trained in DFL planes in addition to training planes. Therefore, upon their graduation from the Primary Flying School and transfer to the Advanced Flying School at Kelly Field, the flying training and experience of the students will be such as to enable them immediately to take most advanced work.

During their first month at the Advanced School, students will receive training both as pilot and observer in the observation type of plane, after which the class will be split up and they will specialize in whichever one of three branches of military aviation—pursuit, bombardment, or attack—they are assigned on the basis of their individual fitness. According to new assignments they that will fly the pursuit planes, the new observation planes, or the bombing and cargo type.

Send Field Development Authorized

The War Department will shortly begin development of "Send Point Field, Harris, Wash., according to an announcement by Albert G. W. Corryall, an aid to Lieut. Gen. John C. Messersmith. In the announcement it was revealed that Lieutenant Corryall, without definite authorization, had prepared a development plan for Send Point, contemplating an expenditure between \$5,000,000 and \$7,000,000, had submitted them to the Bureau of Aeronautics at Washington, and had had them returned to him with official O.K. for a \$1,500,000 expenditure. The large development was marked "possible" and "probable" and was estimated to require \$1,500,000. The plan for a complete hangar to cost \$1,500,000, an engine overhauling shop, \$750,000, a plane overhauling shop, \$800,000, truck equipment and runway, \$750,000, administration, \$500,000, gas, water and oil storage, \$250,000, steamboilers, \$100,000, \$500,000, lavatories, \$250,000, office quarters, \$100,000, public facilities, \$250,000, post, \$100,000, and railway construction, \$200,000.

To Place 100 Reserve Officers on Duty
In accordance with the five year program, 100 reserve officers of the Army Air Corps are to be placed on active duty with tactical units for one year beginning July 1, according to official news from the War Department. Commending officers are requested to forward as many applications as possible before May 1.

All applicants must be listed physically qualified within six months preceding the beginning of the tour of active duty. They must, furthermore, be either graduates of the Air Corps advanced flying course subsequent to July 3, 1931 or have a total of 500 hours of experience as pilots of service planes or similar type, 100 of which must have been flown during the six months preceding application.

Lieutenant Schild is Cited

Lieut. Christian P. Schild of the Marine Corps will receive the Medal of Honor for his heroism in Nicaragua when he is voluntarily removed wounded by airplane while under fire on Feb. 6, 1931, and it at Guaymas. Approval of the award was given by Secretary of the Navy William J. Clegg, and will be made by President Coolidge.



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Attention aviators: Graphite valve guides threaded into OX and OXK cylinders. Removable valve seats installed. Shapton piston and connecting rods. Various sizes. \$1.00 per set. E. Flying Co., 587 Locust St., Shading, Ill.

For sale: Established airport equipment, hangars, Waco 18, OX-5 Standard, extra OX-5 motor, Ford gas truck, tools and extra parts. No field rent. Waco agency. General aviation maintenance. Everything for \$6,000. Valley County, Wis., Box 878, Horsham, Tenn.

For sale: Standard J-1, one last Yearwood, new controls, good running order, immediate, located in New York, can be seen on time. Box 560, Aviation.

For sale: Pumper Downward with Wright Whirlwind J-4 engine, landing and navigation lights and parachute flares. Both plane and engine recently overhauled by manufacturer. Condition excellent. Box 816, Aviation.

One Standard, one Jenny, one Aero, all less motor. One OX-5 with OX-5, one Waco with OX-5, two completely rebuilt Standard with OX-5, one model A Hmo, also Standard waco, trimble and stream. Stock priced right. Write me. St. Louis Aircraft Co., Anglin, Mo.

For sale: Two C-46's with light starters \$1200.00. Four model C-46's with light starters and one model A-1. Located with light starters for \$200.00. New Orleans Air Line, New Orleans, La.

For sale: Good training ship and motor in A1 shape cheap. Ship for use as motor only. Dual control. Just the ship for flying club to learn as; strong construction, wings not repaired, otherwise in A1 shape. For price and particulars write to: Dave Davis, Box 100, Glen Dale, N. Y.

For sale or exchange: Radio, new magnifying 6 tube superheterodyne. Electronic circuit, 100% dry, no batteries, uses 220 power supply. In beautiful condition. Excellent as 60 work or exchange, replacement engine. Operates without need for amp. New ratings every night. Truly enable any other radio in town, selectivity, distance and volume. \$400.00 cash or trade for airplane or parts to build one. Plans sent by airtel. Y. B. McDonald, 3555 Hawthorne St., Torrance, Calif.

For sale: One \$60.00 Husiney crankshaft, one set Standard V cylinder engine, one \$100.00, one \$100.00 French Husiney less than 100 hours total time, overhauled, A1 shape for OX-5-A1 shape. Wanted price on parts necessary to convert 220 to 180 Husiney. Robert O. Phelan, La Jolla, Calif.

Carlson K-4 motor for sale completely overhauled and in A1 condition. Fully equipped. Price \$100.00 each. Backlund Airways, Inc., No. 1 Anasole Road, Green Ridge, Staten Island, N. Y.

For sale: Lawrence type motor, 30 hp, brand new, complete with propeller for sport plane builders \$125.00. Box 833, Aviation.

3 new OX-5 motors in original crates will be sold in highest bidder. Write after to L. L. Adcox, 374 Waco St., Portland, Oregon.

For sale: American Eagle, OX-5 motor, 30 hp, 100 hours. Dual motor, 100 speed indicator, speaking tubes with two lights. Tools complete. A-1 condition. \$1000. Al Carter Field, 11 N. 10th, 131 East 62nd St., New York City.

For immediate sale: OX-5 (slightly used), had bad one first top overhaul and now has J-2 brand new 30 hp motor. Also installed. Black top 1900. Complete \$415.00. Wire or write Dave Davis, Flying Field, 2709 Pennsylvania Ave., Cincinnati, O.

New Also two plane airplane with new American 5 cylinder motor will sell reasonable or trade for good OX-5 Standard or OX-5 motor. Two sport plane motor for sale \$200.00. Lawrence Bishop, Lake, Kans.

For sale: OX-5 \$250.00 up. Heli-Sect A 7 A S, 100 hp, 100 hours, 118 hp, brand new, \$400.00 each. Y.R. dual motor installed. Black top 1900. Complete \$415.00. JN wings \$24.00 each. Box Torrey, Corning, Calif.

For sale or trade: Boeing airplane made over to last place. One wing slightly damaged, motor in A1 shape, a good buy for \$400.00. Don David, Torrey, Glen Dale, N. Y.

One 25 hp, aluminum, Avco motor and Hartzell propeller. First class condition. Four hours in air. Motor in A1 shape, 5000-1400 ft. Detroit, Mich.

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Wanted: Position with flying career by young lady pilot, either commission or salary. Box 817, Aviation.

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Wanted: One new converted Gouge engine. Box 828, Aviation.

Wanted: Good 3 place OX-5 motorized ship. Willing to make minor repairs. Enclosed or Waco preferred. E. R. White, 130 St. James Place, Buffalo, N. Y.

Wanted: 60 or 90 hp, Avco motor, State condition and price. Good OX-5 for sale. Frank McCallum, 5045 Tenth Ave., Detroit, Mich.

Wanted: At one steel hanger for two or more ships. State size, price and approximate weight and type of construction to first communication with the Atlantic Airport, Inc., Westbury, N. Y.

Wanted: Airplane engine or flying. Will trade 1900 Bush airplane & Sport and play with airplane. Waco or Waco. Fred Hollingsworth, 1705 First St., Jackson, Mich.

Wanted: Waco 10 is good condition or other OX-5 ship. Give motor time and lowest price. Howard H. Plak, R.D. 1, Erie, Pa.

Wanted: Dual Waco, Travel Air or Standard with or without motor. Also used motor of any make. State cash price and condition of ship or motor. Kolbert's Aircraft, St. Charles, Ill.

Wanted: Good OX-5 motor or parts. Also OX-5 motor and OX-5 crank case. Box 795, Aviation.

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